

Memorandum

TO: HONORABLE MAYOR
AND CITY COUNCIL

FROM: Kerrie Romanow

SUBJECT: SANITARY SEWER FLOW
STUDY UPDATE

DATE: February 9, 2015

Approved

D. DSYL

Date

2/10/15

REPLACEMENT

REASON FOR REPLACEMENT

The Sanitary Sewer Flow Study Update memo and consultant "City of San Jose Phase 2 Flow and Load Study Technical Memorandum No. 2" report were presented to the Transportation and Environment Committee (T&E) on November 3, 2014, and to the Treatment Plant Advisory Committee (TPAC) on November 13, 2014. At the November 13, 2014 meeting, TPAC directed staff to obtain and review water consumption data for County Sanitation District Nos. 2-3 (CSD 2-3), Cupertino Sanitary District (CuSD), and Burbank Sanitary District (Burbank), and to update the sanitary sewer flow estimates for each of these agencies. In addition, this replacement memo clarifies information in Table 5: FY 14-15 Treatment Plant O&M Cost Sharing Impact using Updated Flows and Household Sizes. This replacement memo and updated Sanitary Sewer Flow Study report includes that updated information.

RECOMMENDATION

1. Accept the updated staff report regarding the attached Sanitary Sewer Flow; and
2. Approve the proposed changes and policy recommendations for future updates to the revenue program for the San José-Santa Clara Regional Wastewater Facility.

OUTCOME

Approval of the staff recommendations would update the assumptions regarding wastewater flow and household sizes for the cities of San José and Santa Clara and the Tributary Agencies; and establish a process for regular updates to assumptions for allocating wastewater treatment costs between the various agencies.

EXECUTIVE SUMMARY

In August 2012, the Auditor issued a report entitled “Environmental Services: A Department at a Critical Juncture,” and recommended (1) updating the assumptions for residential sanitary sewer rates, and (2) establishing a policy for periodic updates to these assumptions. The City retained Carollo Engineers (consultant) to conduct a sewer flow study. The flow study involved a detailed flow analysis for residential customers, a strength analysis for residential and non-residential customers, and a mass balance comparing estimated sewage discharges with influent to the San José-Santa Clara Regional Wastewater Facility¹ (Wastewater Facility).

Residential flow assumptions for all agencies, with the exception of West Valley Sanitation District (WVSD), have not been updated since 1975. Based on the findings of this study and prior studies, the current San José-Santa Clara Regional Wastewater Facility Revenue Program (revenue program) residential flow assumptions should be updated. Staff recommends updating these assumptions using a unique flow assumption (gallons per person per day) and household density (number of persons per household) for each agency and customer classification. This approach provides the best representation of sewer flows, and leads to a more accurate allocation of cost between agencies. It also uses a methodology that is simple to update based on future census data and water consumption records.

To create a unique set of flow assumptions for each agency, the consultant evaluated almost 666,000 water consumption records of residential customers to estimate sewer flows. The Technical Advisory Committee (TAC), which is comprised of staff from San José, Santa Clara, and the Tributary Agencies, discussed the approach at a workshop on October 1, 2014, the Phase 2 Sanitary Sewer Flow Study report was reviewed by T&E on November 3, 2014 and by TPAC on November 13, 2014. The flow assumptions for each jurisdiction were based on winter water consumption data for 2010, 2011 and 2012.

The consultant performed a mass balance, which compares the measured flow Biochemical Oxygen Demand (BOD), Total Suspended Solids (TSS), and Ammonia (NH₃) entering the Wastewater Facility to the calculated values that result from the current rate calculation process, as well as the calculated values from the proposed alternatives. The consultant found that the actual strength parameters from the influent were not consistent with the assumptions under the current Wastewater Facility revenue program. Staff recommends that San José, Santa Clara and the Tributary Agencies conduct a wastewater strength-sampling program. Until a study has been completed to determine actual residential wastewater strengths, staff recommends using the current concentrations, which are consistent with standard industry parameters and the State Water Resources Control Board Revenue Program Guidelines.

Unlike the residential flow, the non-residential water consumption data is reviewed on an annual basis in order to update individual non-residential customer flow, and strength amounts are

¹ The legal, official name of the facility remains San Jose/Santa Clara Water Pollution Control Plant, but beginning in early 2013, the facility was approved to use a new common name, the San José-Santa Clara Regional Wastewater Facility.

updated pursuant to the Revenue Program Guidelines approved commercial user strength characteristics. Updating non-residential flow and strength parameters would require a more detailed flow study and extensive sampling of wastewater flows for each user type, therefore, Staff does not recommend any changes to the non-residential categories, flow or strength parameters at this time.

It is recommended that the revenue program assumptions be updated every ten years to ensure accuracy and equity. This may include a combination of updating the household densities used to estimate residential sewer flows based on the latest census information and review of water consumption data. It may also include updating residential and non-residential wastewater strength parameters based on more current loadings data.

BACKGROUND

In August 2012, the City Auditor released audit Report 12-06, Environmental Services: A Department at a Critical Juncture. The audit scope included a review of the Sanitary Sewer Use Charge (SSUC) and the allocation of costs to customers. The Auditor recommended updating assumptions driving sanitary sewer rates for residential customers, and establishing a policy to periodically evaluate assumptions that influence rates, including household size, daily per capita sewage flow, and housing stock composition. The Administration agreed with the recommendation.

The Environmental Services Department (ESD) completed a preliminary flow study for the Wastewater Facility for San José residential customers in February 2013. Due to the short time frame of the study and the lack of easily accessible data on water use trends for the entire service area, the findings were based on a limited dataset. In a March 2013 Information Memo to Council, ESD described plans to prepare and release an RFQ for a consultant to expand the study to include the entire Wastewater Facility service area, water consumption data for multiple years, and commercial sector data.

The City did not receive any proposals in response to an RFQ for a consultant released in July 2013. The RFQ was revised based on feedback from potential proposers, and the City received multiple proposals in response to a revised RFQ released in October 2013.

The City retained Carollo Engineers Inc. in March 2014 to perform a sanitary sewer flow and load (strength parameters) study for the entire service area of the Wastewater Facility. The Wastewater Facility capital and operating and maintenance costs are allocated to the Tributary Agencies based on their sanitary sewer flow and strength parameters (BOD), (TSS), (NH₃). The balance of the cost is shared by San José and Santa Clara based on each jurisdiction's share of the total assessed value for property in the two cities.

The first phase of the study was completed in May 2014. During this phase, the consultant compiled data pertinent to the sanitary sewer flow analysis work, reviewed the current revenue

program and customer classifications, reviewed wastewater strength parameters used in the current revenue program, identified reporting variations, and developed an approach to complete their analysis of sanitary sewer flow and strength data. Staff provided the T&E Committee a status report in June and to Council on August 5, 2014.

Staff also provided TAC, a draft report on the preliminary findings and recommendations on July 16, 2014. TAC agreed with the recommendation to proceed updating the residential flow and household values based on a consistent approach, and to proceed with second phase. The second phase of the study, conducted a detailed flow analysis for residential customers, a detailed flow and strength parameter analysis for residential and non-residential customers, and conducted a mass balance. This level of analysis was completed for the cities of San Jose, Santa Clara, and Milpitas, and for WVSD residential customers. Water consumption data was not available from Burbank, CSD Nos. 2-3, or CuSD when Phase II of the study was completed in October 2014, Phase II of the study was presented to TPAC on November 13, 2014, at which time, TPAC requested that Burbank, CSD Nos. 2-3 and CuSD provide their customer water consumption data to the consultant for analysis. The Phase III report and following analysis incorporates the analysis of the WVSD non-residential customer data, as well an analysis of the water consumption data from Burbank, CSD Nos. 2-3, and CuSD customers.

ANALYSIS

The revenue program is a cost recovery program which is subject to the State Water Resources Control Board (SWRCB) Revenue Program Guidelines. The sanitary sewer ratepayers supporting the Wastewater Facility are comprised of residential and nonresidential customers. Consequently, a change in the residential percentage of cost would necessarily impact the non-residential share of the cost. Staff determined through the flow study that the average household sizes (number of people per household) and residential flow per person have changed, resulting not only in a shift to each agencies' share of the Wastewater Facility operating and maintenance costs, but also a shift between residential and non-residential users. Since each agency establishes their own methodology for sewer rates, the impact of changes to the residential assumptions will vary between the agencies.

Flow Study Methodology and Analysis

The consultant engaged in four major sub-tasks: a detailed flow analysis for residential customers; a strength analysis for residential and non-residential customers; a mass balance comparing estimated sewage discharges with influent to the Wastewater Facility; and recommendations to update the wastewater flow and strength parameters used in the current revenue program.

Sewer rates are developed in conformance with the SWRCB "Revenue Program Guidelines for Wastewater Agencies," March 1998 edition (most recent edition), and in accordance with Proposition 218. The guidelines require that rates must recover costs of operations and maintenance (including replacement) from users of the system in proportion to the volume and

strength of sewage discharged. To assure that system users are charged equitably for service, the system's annual revenue requirements are allocated separately for both capital and operations and maintenance to the parameters of flow, BOD, TSS, and NH3. State guidelines allow residential users to be divided into single family, multiple family, and mobile home subgroups to allow for more refined cost allocations. Each classification has its own estimated flows and loadings for single family, multiple family, and mobile homes. All other users are classified as non-residential, and include Commercial, Institutional and Monitored Industries subgroups.

Residential Density

The revenue program has been using 1975 average countywide densities (number of people per household) of 3.37 people per household for single-family homes, 2.05 people per multi-family home, and 1.90 people per mobile home. Since 2006 and based upon a wastewater flow study conducted in 2005, WVSD uses average household sizes of 2.63, 2.46, and 2.41 respectively.

The current study uses updated population estimates for a five-year period from the 2012 American Community Survey (ACS) to update the average household size. Census Tract data from the 2012 ACS was used to estimate the densities for the various agencies.

On a countywide basis, household sizes for both multi-family and mobile home have increased substantially since 1975. The 2012 ACS data also shows a 32% variance across the agencies for average single-family household size, a 60% variance for multi-family household size, and a 67% variance for mobile home household size. Table 1 illustrates the residential densities (household sizes) used in the current revenue program (County 1975 and WVSD 2005) and the updated County and agency-specific densities (2012 ACS).

Table 1: Residential Household Sizes (Number of persons per unit, or "Density")

Housing Type	County (1975)	WVSD (2005)	County (2012)	Milpitas (2012)	San José (2012)	Santa Clara (2012)	Burbank (2012)	CSD 2-3 (2012)	CuSD (2012)	WVSD (2012)
Single Family	3.37	2.63	3.15	3.54	3.34	2.96	2.76	3.63	2.94	2.74
Multi Family	2.05	2.46	2.37	2.73	2.53	2.26	2.64	3.29	2.47	2.06
Mobile Home	1.90	2.41	2.71	2.24	2.97	2.28	-	2.73	-	1.78

Residential Flows

San José, Santa Clara, and the Tributary Agencies currently calculate the "flow component" of the revenue program based on an estimated flat rate flow or gallons per day per household (GPD/household). The methodology used for the flow assumption is (1) the gallons per capita per day (GPCD) flow rate, multiplied by the (2) the number of persons per household. All of the agencies, with the exception of WVSD, use 219 GPD for single family, 123 GPD for multi-family and 124 GPD for mobile homes. Since 2006 and based on a 2005 study, WVSD uses 184 GPD for single-family, 160 GPD for multi-family, and 157 GPD for mobile homes.

The Phase 2 and 3 studies updated residential flow assumptions by reviewing residential water consumption data during the winter months of January, February, and March. The assumption is that water consumption during the winter months would be primarily indoor consumption and best approximates residential sewer discharges. Three years of winter water consumption data (2010-2012) from Milpitas, San José, Santa Clara, Burbank, CSD 2-3, CuSD, and WVSD was analyzed to determine the flow rate per household.

In order to eliminate outliers in the water consumption data, the consultant considered two approaches: (1) a flow cap of 400 gallons per day/household for single-family dwellings and 300 gallons per day/household for multiple-family and mobile home dwellings; and (2) a dynamic Interquartile Range (IQR) cap. The 400GPD/household and 300GPD/household is approximately twice the median single-family, and multiple-family/mobile home flow rates of the surveyed agencies and attempts to eliminate anomalous account recordings; however, it does not recognize accounts that consume over those caps. A single cap of 400 GPD for single-family and 300 GPD for multiple-family and mobile home, were selected because using the caps has the advantage of consistency and does not favor one agency over another. Using the 400 GPD/household for single-family and 300 GPD/household for multiple-family and mobile flow caps also better reconcile with the influent flow at the Wastewater Facility. While statistically valid, the IQR method creates a different cap across agencies and customer classes and could be considered biased. For example, an agency with a significant amount of outdoor irrigators would have a higher average sewer discharge. The IQR method also results in higher average flows than we see at the Wastewater Facility. For these reasons, the consultant recommends the 400 GPD for single-family and 300 GPD for multiple-family and mobile home caps to be a reasonable method for eliminating unreasonably high data points that would otherwise skew the results.

Table 2 illustrates the updated gallons per person per day (GPCD) using county average household density, as well as illustrating updated residential flow per person using the 400 GPD/household cap for single-family and the 300 GPD/household cap for multiple-family and mobile homes, and agency-specific household density. Please see the “Flow Cap” section of the attached Technical Memorandum No. 3 for additional information.

Table 2: Residential flow per person (GPCD)

Housing Type	County (1975)	WVSD (2005)	County (2012)	Milpitas (2012)	San José (2012)	Santa Clara (2012)	Burbank (2012)	CSD 2-3 (2012)	CuSD (2012)	WVSD (2012)
Single Family	65	70	59	51	60	61	55	53	66	68
Multi Family	60	65	58	51	53	66	47	49	60	70
Mobile Home	65	65	51	63	51	-	-	-	-	65

The consultant evaluated various approaches to establishing assumptions to update the Revenue Program including: (1) the current methodology of using the average countywide densities and flows for all households (except WVSD); (2) using the countywide density and each agency's individual flow; and (3) using the countywide flow and each agency's individual density.

At an October 1, 2014 TAC workshop, staff from San José, Santa Clara, and the Tributary agencies discussed methodology options and agreed that using agency specific flow and densities would best allow for a more equitable cost allocation due to the variance in flow and household size between the various jurisdictions. Please see the "Updating Residential Flow Assumptions" section of the attached Technical Memorandum No. 3 for additional information.

Table 3 illustrates the updated gallons per household per day (GPD/household) for San José, Santa Clara, and the Tributary Agencies using county average household density, as well as illustrating updated residential flow per person using agency-specific household density. Table 4 illustrates the percentage change for household types.

Table 3: Proposed Residential flow per household (GPD/household = Density x GPCD)

Housing Type	County (1975)	WVSD (2005)	County (2012)	Milpitas (2012)	San José (2012)	Santa Clara (2012)	Burbank (2012)	CSD 2-3 (2012)	CuSD (2012)	WVSD (2012)
Single Family	219	184	186	181	200	181	152	192	194	186
Multi Family	123	160	137	139	134	149	124	161	148	144
Mobile Home	124	157	138	141	151	-	-	-	-	116

Density values (average household size) from Table 1; GPCD values from Table 2

Table 4: Change in Residential flow per household (percent change from current assumption)

Housing Type	County (1975)	WVSD (2005)	County (2012)	Milpitas (2012)	San José (2012)	Santa Clara (2012)	Burbank (2012)	CSD 2-3 (2012)	CuSD (2012)	WVSD (2012)
Single Family	219	184	-15.1%	-17.4%	-8.7%	-17.4%	-30.6%	-12.3%	-11.4%	1.1%
Multi Family	123	160	11.4%	13.0%	8.9%	21.1%	0.8%	30.9%	20.3%	-10.0%
Mobile Home	124	157	11.3%	13.7%	21.8%	-	-	-	-	-26.1%

Residential Customer Classifications

San José, Santa Clara, and the Tributary Agencies use single-family, multi-family, and mobile home classifications to distribute O&M costs in the revenue program. The consultant reviewed available data and municipal code definitions to determine how the different agencies classify

each of the residential customers into one of these three groups. While the analysis revealed some differences in classifying residential properties, the overall discrepancies are relatively minor. Please see the "Residential Customer Classifications" section of the attached Technical Memorandum No. 2 for additional information.

Residential Strength Parameters

All of the agencies have used the same strength parameters for BOD (250 mg/L), TSS (250 mg/L), and NH₃ (35 mg/L) since 1975. While WVSD updated its flows for single-family and multi-family residences after a 2005 wastewater flow study, it did not change its strength parameters.

Neither the literature nor available data from other wastewater agencies supported changing the strength parameters currently used, which are in the typical range and have been approved by the SWRCB. After consultation with TAC, the consultant recommended leaving the current strengths unchanged until a more thorough study could be performed to include analysis of residential sewage samples from all of the agencies.

Non Residential Flow and Strength Parameters

All accounts including commercial, industrial, and institutional users are grouped under the general heading of non-residential. The calculation of charges for most non-residential users is based on their water consumption and the strength parameters for the category to which they are assigned based on SWRCB Revenue Program Guidelines. Since sewage discharge is generally not measured directly, water consumption provides a proxy for sewer use. In some agencies, such as San José, water consumption for winter months is used to exclude irrigation flows and other outside uses that are higher during dry months. A return to sewer percentage is applied over a variety of commercial types. In other agencies, the water consumption for all 12 months is used, with a return to sewer percentage applied to adjust total consumption to exclude outdoor uses. Some businesses have much lower return factors that reflect on-site water consumption or evaporation, such as facilities with cooling towers.

For non-residential water consumption, a comparison was made between estimated sewer flows based on:

- (1) Annual water consumption using return to sewer percentages, which varied widely across agencies; and
- (2) Annualized winter water consumption without the application of the return to sewer percentages. Winter water consumption was defined as water consumed during January, February and March.

The results show that in terms of non-residential water consumption, using annual water consumption data to estimate sewer discharges produces a higher water consumption estimate when compared to using annualized winter consumption data. The difference was found to be about 20%-30% between the two non-residential sewer flow methodologies used by the Wastewater Facility Agencies. There is no industry standard for estimating sewage flows across

broad ranges of commercial and industrial classifications, and both approaches to estimate non-residential flow are reasonable and used by the wastewater industry. Without substantial flow monitoring data, it is not possible to definitively determine which approach is more accurate. However, estimating non-residential wastewater flows based on both winter water consumption and annual water consumption with a return to sewer factor are both widely accepted methods. In reviewing with TAC the analysis of using winter versus annual water data to estimate non-residential flow, there was a consensus that the existing data did not justify having all agencies use the same methodology, which could result in cost allocations that impacted individual agencies or users in ways that could not clearly be shown to be more fair than the current system. For additional information, please see the "Winter Versus Annual Non-Residential Flow Assumptions" section of the attached Technical Memorandum No. 2.

In each of the agencies, most of the non-residential users are combined into categories that are expected to have roughly similar strength parameters; however, the agencies do not use the same combinations. San José uses 59 non-residential categories, while the other agencies use significantly fewer non-residential categories.

Individual non-residential accounts that discharge more than 25,000 gallons per day are treated differently, with their rates being based on direct monitoring of their sewage flow and strength parameters. There are only about 61 monitored industries in the entire service area (30 in Santa Clara, 18 in San José, and 13 in Milpitas).

The consultant reviewed the current user categories for non-residential accounts in all of the agencies, and tested some alternative methods to group them more uniformly into fewer categories. All of the current charges are based on strength parameters that have been approved by the SWRCB for many years and accepted by local agencies and users. After discussion with TAC, the consultant recommended that the current methods be continued unless a more detailed study with extensive sampling and analysis of wastewater flows from each user type in each agency could be performed.

Non Residential Customer Classifications

Across agencies, there is often significant variability in the assumed wastewater loading coming from a single class of non-residential customers as each agency employs its own set of loading assumptions for BOD, TSS, and NH₃. In many cases, the loading assumptions are similar or identical for the same Standard Industry Classification (SIC) Codes. However, some loading assumptions are very different for the same SIC code for different agencies. These differences can lead to a disparity between how different customers, with similar load values, in the same SIC code, are charged by different agencies.

The consultant evaluated the potential benefit of classifying non-residential customers into groups based on common strength ratios. The consultant recommended sorting and grouping all non-residential users with similar impacts on the wastewater system within the same group. This methodology would reduce the number of non-residential customer categories. This approach was discussed at the October 1, 2014 Special TAC meeting and it was determined that it would

initially involve significant administrative effort to implement this change, and that making this change absent updated non-residential strength information would not result in improved non-residential flow and strength estimates. For additional information, please see the “Non-Residential Classifications” section of the attached Technical Memorandum No. 2.

Mass Balance

A mass balance looks at the measured flow and loadings of the Wastewater Facility’s influent, which is frequently sampled and analyzed. The consultant performed an analysis that allows for the assumptions made in the revenue program to be tested without doing new field work. By comparing the total measured flow, in millions of gallons per day, and the measured loadings, in pounds per day, with the calculated values based on the flow and strength parameters used in the Revenue Program, the consultant tested the reasonableness of current customer data assumptions for flow, BOD, TSS, and NH3. The study found that flow values for the current revenue program roughly approximates the amount of flow that enters the plant, but understates the amount of BOD, TSS and NH3 entering the Wastewater Facility. Because the mass balance resulted in inconsistent loadings at the Wastewater Facility relative to the revenue program, it may be necessary to conduct a wastewater strength-sampling program. It is unknown whether the cause of the discrepancy is due to the residential or non-residential loading assumptions. A residential strength-sampling program should be commissioned first to see if the residential parameters are correct.

Impact of Recommended Changes

Allocation of costs by agency: Using the FY 2014-2015 revenue program as the baseline, it was determined that the impacts of the recommended changes to the allocation of costs across San José, Santa Clara, and the Tributary Agencies varies by agency. The updated flows and household sizes may result in substantial changes between customer classes. Table 5 illustrates the potential change in cost allocation shifts between agencies using updated flow and household size. This table is provided to illustrate the potential impact of updating residential flow and household sizes.

Table 5: FY 14-15 Treatment Plant O&M Cost Sharing Impact Using Updated Flows and Household Sizes

FY 14-15 budgeted shares 3/11/14 reports to Tributary Agencies			POTENTIAL IMPACT OF NEW RESIDENTIAL FLOW ESTIMATES				
AGENCY	Percentage	O&M Budget Shares	Revised Percentage	Difference	% Change	O&M Redistributed	\$ Increase (Decrease)
SJ	65.493	\$60,121,800	65.299	(0.1940)	(0.296)	\$59,944,500	(\$177,300)
SC	13.898	\$12,758,500	13.857	(0.0410)	(0.295)	\$12,720,800	(\$37,700)
WVSD	8.264	\$7,586,800	8.803	0.5390	6.522	\$8,081,500	\$494,700
CuSD	5.144	\$4,722,500	5.165	0.0210	0.408	\$4,741,700	\$19,200
Milpitas	5.966	\$5,476,500	5.717	(0.2490)	(4.174)	\$5,247,900	(\$228,600)
CSD2-3	.956	\$878,000	0.929	(0.0270)	(2.824)	\$852,500	(\$25,500)
Burbank	.279	\$255,900	0.230	(0.0490)	(17.563)	\$211,100	(\$44,800)
Total	100%	\$91,800,000	100%	0%		\$91,800,000	\$0

Because the revenue program is a cost recovery program, any change for one customer group or within the same customer group could impact the other customer groups. For example, as total flows to residential customers are changed based on updates provided by this study, there could be a shift of costs among the non-residential customers, assuming their flows are consistent year-over-year, and the budget that is allocated to all customers in the service area for the Wastewater Facility remains at the same level year-over-year. While the changes between broad user groups are small, the potential for greater changes between specific customer types is possible. The final cost allocation is dependent upon each user's total flow and strength parameters.

As stated above, updated flow assumptions for the residential sector could result in significant changes to the allocations for different customer classes. In addition, the rebuild of the Wastewater Facility may also require rate increases. A ten-year funding and rate study is currently underway. Recommended changes as a result of the Flow Study, as well as findings from the ten-year funding and rate study, will be used to develop the revenue program cost allocation for FY 2015-2016.

Revenue Program Update

To ensure accuracy and equity, staff is recommending that the revenue program assumptions be updated every 10 years. This may include a combination of updating the household densities used to estimate residential sewer flows based on the latest census information and review of water consumption data. It may also include updating residential and non-residential wastewater strength parameters based on more current loadings data.

EVALUATION AND FOLLOW-UP

In February-March 2015, as part of the annual revenue program process, San José will work with Santa Clara and all Tributary Agencies to allocate costs based on the updated flow and household size numbers. Each agency will then use their updated costs allocations, and other agency-specific factors, to set their rates. For San José, staff will bring forward any rate recommendations which may result from the flow study update as well as other CIP and O&M costs, to Council as part of the 2015-2016 budget process.

POLICY ALTERNATIVES

Alternative 1: Make no changes to the current residential household size or residential flow assumptions.

Pros: The current rate model, household sizes and flow data have been approved by the State Water Resources Control Board (SWRCB), and no changes are required by that agency. Keeping the current household size and flow amounts minimizes changes to property owners' SSUC rate as well as minimizes cost shifts between San José, Santa Clara, and the Tributary Agencies.

Cons: The current rate model is based upon 1975 data. Census data indicate that average household sizes have changed since 1975, and therefore, using the 1975 number does not properly allocate costs between household categories. Based upon the results of the recent flow study, the residential flow assumptions using 1975 data do not reflect current usage characteristics.

Reason for not recommending: Using the 1975 data does not result in the proper allocation of costs between the residential categories or between San José, Santa Clara, and the Tributary Agencies.

Alternative 2: Install individual meters to capture water consumption data at the individual dwelling unit level and establish volumetric pricing.

Pros: May result in more accurate individual sewer rates by charging ratepayers based upon the individual ratepayers' usage.

Cons: Sewer flow meters are not designed to measure residential sewer flow as these meters need constant sewer flow for accurate measurement, therefore, metered water consumption data would need to be used to estimate sewer flow. Switching from the current tax roll billing system would result in higher administrative and technology costs. Short term billing could also negatively impact financial ratings and future borrowing costs. The cost of installing water meters and piping at each individual multiple-family and mobile home dwelling unit would be borne by the property owners and could be cost prohibitive. Since water and wastewater services are provided by different entities and water consumption data is provided in different formats, accessing water consumption data would also be difficult due to technology constraints.

Reason for not recommending: Residential sewer flow meters would not accurately measure residential sewer flow. The cost of installing individual water meters, piping, and new billing system would actually result in higher costs to ratepayers without yielding significant benefits. Changing to volumetric pricing would also result in annual revenue fluctuations, which could negatively impact the financial standing of the RWF and increase the cost to borrow funds for the rebuild of the wastewater facility, which would be ultimately borne by the ratepayers. Additionally, a rate structure that is highly volumetric would not recognize that the majority of the annual wastewater treatment costs are fixed costs. Lastly, if the rate structure resulted in lower water consumption, it might actually result in higher concentrations of BOD, TSS, and NH₃, and thus higher long-term treatment costs.

Alternative 3: Update average household size using the 2012 ACS data, and update tributary-wide average residential flow assumptions determined by the 2014 Flow Study.

Pros: Continues current rate model assumptions using service area averages.

Cons: Results in a shift in costs between agencies without taking into consideration each agency's specific residential flow assumption or each agency's service area average household size. Using agency-specific flow data for the four agencies which we have are able to update residential flow assumptions results in a more equitable allocation of costs for those agencies.

Reason for not recommending: Using system-wide averages does not result in the most equitable allocation of costs between the residential categories or between San José, Santa Clara, and the Tributary Agencies.

PUBLIC OUTREACH

In addition to the required posting of this item with the T&E and Council Agendas, the Flow Study was previously discussed at a T&E meeting on May 14, 2014. Special meetings of the TAC were held to discuss the study on July 16, 2014, September 22, 2014, and October 1, 2014 and the recommendations were discussed at the regular November meetings of TAC and TPAC. On January 15, 2015, ESD presented to the Housing and Community Development Commission preliminary information on the Flow Study, and is returning on February 12, 2015 with updated information. ESD will conduct outreach to multiple-family property owners through the Tri-County California Apartment Association. Feedback from these outreach meetings will be incorporated into recommendations brought forward as part of the 2015-2016 sanitary sewer rate setting process.

This item was heard at the November 3, 2014 T&E meeting and the November 13, 2014 TPAC meeting. It is scheduled for the February 12, 2015 TPAC meeting and March 3, 2015 Council Meeting.

COORDINATION

This memorandum has been coordinated with the City Attorney's Office, the City Manager's Budget Office, the Office of Economic Development, and the Housing Department.

COST SUMMARY/IMPLICATIONS

The consultant's analysis provided recommended updates to the assumptions for residential sanitary sewer rates that may result in 2015-2016 cost shifts between the Wastewater Facility owners and Tributary Agencies, as well as cost shifts between user groups; however, no final determination has been made for 2015-2016. The results of the consultant's report, as well as the San José-Santa Clara Regional Wastewater Facility Ten-Year Funding Strategy (which will be brought forward for TPAC consideration and City Council approval in March), will be considered in developing the 2015-2016 San José-Santa Clara Regional Wastewater Facility Revenue Program.

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CEQA

Not a Project, File No. PP10-067(a), Increases or Adjustments to Fees, Rates & Fares.

/s/Ashwini Kantak for
KERRIE ROMANOW
Director, Environmental Services

For questions, please contact Ashwini Kantak, Assistant Director, at (408) 975-2553.

Attachment: City of San Jose Phase 3 Flow and Load Study Technical Memorandum No.3



CITY OF SAN JOSÉ

PHASE 3 FLOW AND LOAD STUDY

**TECHNICAL MEMORANDUM NO. 3
FLOW ANALYSIS SERVICES**

FEBRUARY 2015

CITY OF SAN JOSÉ
PHASE 3 FLOW AND LOAD STUDY
TECHNICAL MEMORANDUM
NO. 3
FLOW ANALYSIS SERVICES

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1.0 INTRODUCTION

The City of San José's (City's) existing rate structure consists of flow and strength-based charges. Flow is measured in terms of average wastewater flow and strength is measured in terms of biological oxygen demand (BOD), total suspended solids (TSS), and ammonia (NH₃). Treatment costs are recovered from San José and Santa Clara's customers and Tributary Agencies based on wastewater flow and strength.

Currently, the San José-Santa Clara Regional Wastewater Facility (RWF) Revenue Program allocates costs between the RWF Tributary Agencies, which include San José, Santa Clara, Milpitas, Cupertino Sanitary District (CuSD), County Sanitation District No. 2-3 (CSD 2-3), West Valley Sanitation District (WVSD), and Burbank Sanitary District (Burbank). In August 2012, the City Auditor recommended an update to the assumptions that are used in the sanitary sewer rates for residential customers, and to establish a policy to periodically evaluate the assumptions that influence rates, including household residential size, daily per capita flow, and housing stock composition.

In 2013, San José's Environmental Services Department (ESD) conducted a preliminary flow study for the treatment plant and San José's own residential customers. The study observed lower usages of water by San José households than has been assumed by the Revenue Program since 1975. It is also possible that the allocation factors currently used as the basis for the cost distributions in the Revenue Program are outdated and do not reflect current flow and loading discharge characteristics to the RWF. ESD concluded that a more robust analysis should be conducted to properly evaluate the flow and strength of contemporary wastewater in the service area. To this end, ESD has retained Carollo Engineers to review the Revenue Program's methodologies for equity and consistency and to evaluate that the current Program is consistent with State Guidelines.

This Technical Memorandum (TM) is the third phase in a two-step process that seeks to quantify the volume and strength of wastewater produced by residential and non-residential customer classes. The results of this study may be used to update San José's wastewater retail rates and the allocation of operations and maintenance (O&M) costs among the RWF agencies.

The objectives of this memo are:

- Conduct a detailed flow analysis for residential customers.
- Conduct a detailed strength analysis for residential and non-residential customers.
- Conduct a mass balance.

- Provide recommendations to update the wastewater flow and strength parameters used in the Revenue Program.

2.0 UPDATING RESIDENTIAL FLOW ASSUMPTIONS

Flow assumptions used in the Revenue Program are determined differently for residential and non-residential customers. This section discusses residential flow assumptions. Assumptions about residential sanitary flows and the composition of those (Flows, BOD, TSS, and NH_3) are paramount to the allocation of costs between not only the individual Tributary Agencies but also to the distribution of costs between customer classifications within the agencies.

2.1 Current Residential Flow Assumptions Used in the Revenue Program

San José, Santa Clara, and the Tributary Agencies calculate the “flow component” of the Revenue Program based on an estimated flow, gallons per day per household (GPD/household). This assumption is calculated from 1) the gallons per capita per day (GPCD) flow rate and 2) the number of persons per household. All the agencies with the exception of WVSD use a consistent set of assumptions.

San José, Santa Clara, Milpitas, CuSD, CSD 2-3, and Burbank base residential flow assumptions on household size derived from demographic information last updated in 1975, and per capita flows based on a 1975 study. These assumptions are given in Table 2.1.

Table 2.1 Current Residential Flow Assumptions Used in the Revenue Program for Current San José, Santa Clara, Milpitas, CuSD, CSD 2-3, and Burbank Phase 3 Flow and Load Study City of San José			
	GPCD Flow⁽¹⁾	Household Size⁽²⁾	Residential Flow Estimate, GPD/Household
Single-Family	65	3.37	219
Multi-Family	60	2.05	123
Mobile Home	65	1.90	124
Notes: (1) Per capita flows based on a study conducted as part of the first submittal of Revenue Program data in or prior to 1975. (2) Based on 1975 demographic information.			

WVSD conducted its own wastewater flow study in 2005. The results of this study have been approved for use in the Revenue Program. The study estimated population densities and wastewater discharges per dwelling unit as shown in Table 2.2.

Table 2.2 Current Residential Flow Assumptions Used in the Revenue Program for West Valley Sanitation District⁽¹⁾ Phase 3 Flow and Load Study City of San José			
	GPCD Flow⁽²⁾	Household Size⁽³⁾	Residential Flow Estimate, GPD/Household
Single-Family	70	2.63	184
Multi-Family	65	2.46	160
Mobile Home	65	2.41	157
Notes: (1) Capacity Allocation Study, RMC Water and Environment. February 2005. (2) Dry weather flow monitoring data within WVSD. (3) Based on a combination of census population and dwelling unit density data.			

Table 2.3 presents the flow assumptions that ESD developed based on its preliminary flow study for the treatment plant and San José's own residential customers in 2013. Because of a limited data set, the results of San José's 2013 study have not been incorporated into the Revenue Program. San José's 2013 study relied on a single year of consumption data and recommended using county-wide estimates of household populations. For the purposes of this Report, "Countywide" refers to the population and household density estimates for the entire Santa Clara County.

Table 2.3 San José 2013 Flow Study, Not Part of The Revenue Program⁽¹⁾ Phase 3 Flow and Load Study City of San José			
	GPCD Flow⁽²⁾	Household Size⁽³⁾	Residential Flow Estimate, GPD/Household
Single-Family	65	3.15	205
Multi-Family	55	2.37	130
Mobile Home	58	2.71	157
Notes: (1) "Estimated Residential Unit Flow Rates & Review of Strength Characteristics." RMC Water and Environment, February 2013. (2) 2011 winter consumption in San José. (3) 2011 Census countywide estimates.			

WVSD's 2005 study used household population values unique to their service area. As shown in **Figure 2.1** and **Figure 2.2**, below, there is clearly a range of dwelling unit population densities throughout the RWF service area. Therefore, it is reasonable that San José, Santa Clara, and the Tributary Agencies use different household size assumptions in future Revenue Program updates. However, the current Revenue Program assumptions and the studies conducted by WVSD and San José are not based on consistent data sources or methodologies. Phase 3 of this study will use similar methods as these previous studies, but will rely on a longer historical consumption record and employ a uniform methodology that is clear, transparent, and consistent among all the Tributary Agencies.

Figure 2.1 Single-Family Dwelling Unit Density

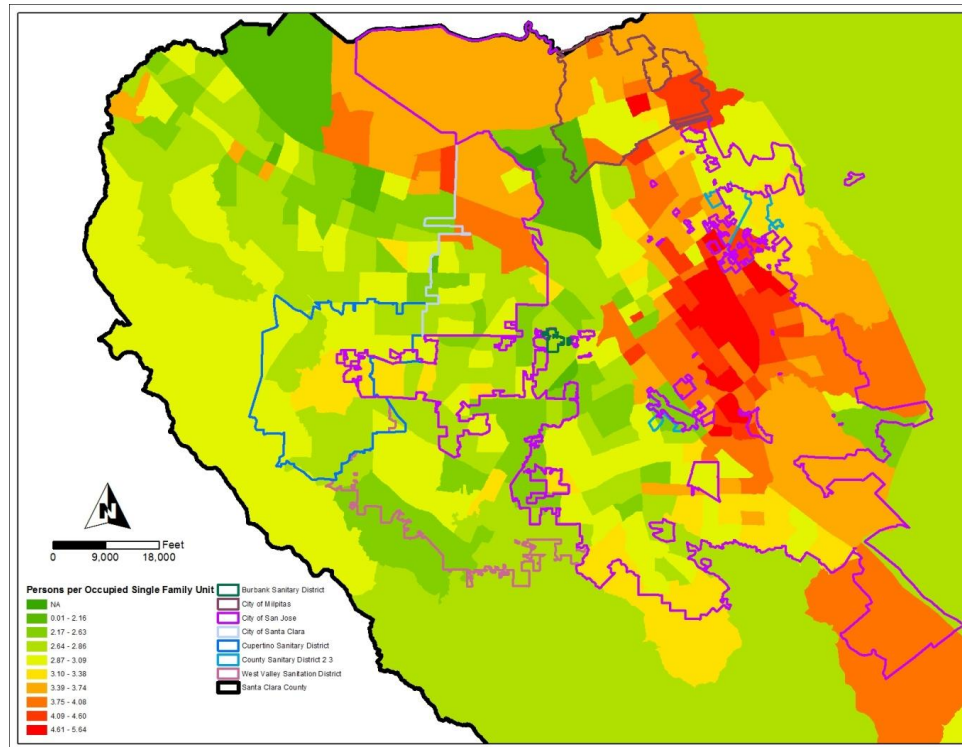
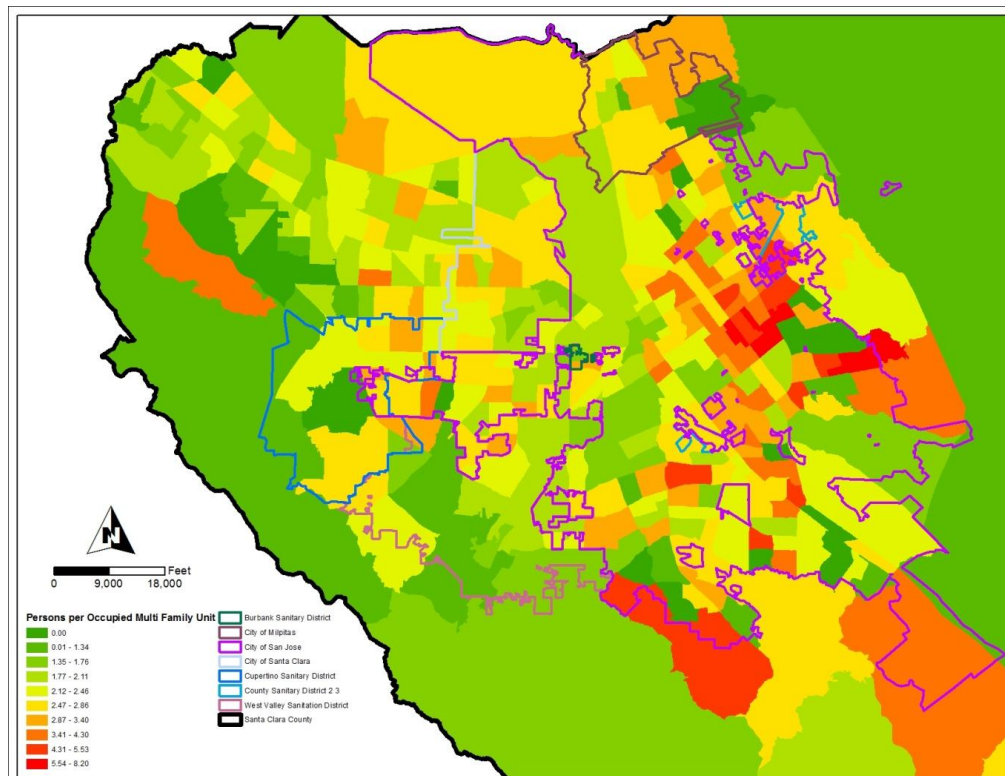


Figure 2.2 Multi-Family Dwelling Unit Density



2.2 Updating Residential Flow Assumptions

In order to provide any updates to the current flow assumptions used in the Revenue Program, a dataset larger than the dataset used for the 2013 Study had to be analyzed. The residential flow assumptions can be broken down into two components: (1) a residential per unit flow rate (GPD) per residential unit type; and (2) a residential household size (number of persons per residential unit type). Together, these two components can be used to obtain a residential per capita flow rate (GPD per person) in order to compare against the current Revenue Program assumptions. Residential flow assumptions were obtained for single-family, multi-family, and mobile home premise types since this is the basis for the Revenue Program

Updated residential flow assumptions were determined by reviewing residential water consumption data during the winter months when water use is assumed to be primarily indoor consumption. For this study, January, February, and March have been designated as the winter months as it is believed to provide a consistent low water demand period that best approximates residential sewer discharges. The process for estimating residential per unit flow rates for the different residential premise types (single family, multi-family, and mobile home) for the different entities is described in the following subsections.

2.2.1 Data Sources

Water consumption data was obtained from the San Jose Water Company, San Jose Municipal Water System (San Jose Muni Water), the City of Santa Clara, the City of Milpitas, Burbank, CSD 2-3, CuSD and WVSD. Water consumption data for the West Valley Sanitation District had been pre-processed by RMC Water and Environment for use in this study.

Specific data is summarized below.

- San José
 - San Jose Muni Water
 - * Years: 2006 – 2014
 - * Residential and non-residential accounts
 - San Jose Water Company
 - * Years: 2011 – 2014
 - * Residential and non-residential accounts
 - Great Oaks Water Company
 - * Years: 2005 – 2013¹
 - * Non-residential only

¹ For consistency with San Jose's data, which went back to 2006, 2005 was not used in the analysis.

- Santa Clara
 - Years: 2005 – 2014
 - Residential and non-residential accounts
- Milpitas
 - Years: 2005 – 2014
 - Residential and non-residential accounts
- Burbank
 - Years: 2011 – 2013
 - Residential accounts
- CSD 2-3
 - Years: 2011 – 2013
 - Residential accounts
- CuSD
 - Years: 2011 – 2013
 - Residential accounts
- WVSD
 - Processed data was provided by RMC for the winters of 2010-2012

Other datasets used in this study include the 2012 San José wastewater-billing database and the residential water service points obtained from both the San Jose Water Company and San Jose Muni Water. These datasets were used to obtain both the number of units for each residential household type as well as the premise type of each residence. The 2012 5-year population and housing estimates from the United States Census Bureau were also used.

2.2.2 Flow Cap

A “flow cap” was used to cap residential flows as a way to eliminate outliers in the consumption data. Although winter consumption data is an industry-accepted standard for estimating residential sewer discharges, considering the breadth of data collected for this study (almost 666,000 individual billing accounts) outliers are inevitable. Fortunately, these outliers are also identifiable. For example, the databases included some billing accounts with substantial outdoor irrigation usage, given California’s recent run of some of the driest winters on record. Additionally, some of the consumption records in San Jose Water Company’s billing database were found to have database irregularities. For example, the number of multi-family units in San José’s wastewater billing database did not always link cleanly to San Jose Water Company’s billing database. Therefore, it was possible for the

number of units to be incorrect in which case the consumption was significantly overestimated.

To eliminate these outliers, Carollo employed two techniques: a cap specific to each premise type and a dynamic “IQR” cap unique to each agency and residential category.

- IQR Cap.** This cap is calculated as 1.5 x Interquartile Range (IQR). This is the most common way to identify outliers. For this study, this approach accounts for natural high volume users unique to each residential category and each agency. The IQR method is statistically more valid but it creates a different cap across agencies and customer classes and could be considered biased. For example, an agency with a significant amount of outdoor irrigators (which would increase the IQR cap) would have a higher average sewer discharge. In addition, this approach results in higher average flows than are currently assumed in the Revenue Program. The calculated IQR caps are shown in Table 2.4.

Table 2.4 Calculated IQR Caps Phase 3 Flow and Load Study 2010 – 2012 Data			
Agency	Single Family IQR Cap	Multi-Family IQR Cap	Mobile Home IQR Cap
Milpitas	460	370	124
San José	545	425	380
Santa Clara	495	430	NA
Burbank	415	350	NA
CSD 2-3	615	490	NA
Cupertino	585	380	NA
WVSD	605	375	180
Weighted Average IQR Cap	540	410	370

- Premise Type Specific Cap.** Carollo initially employed a cap of 400 GPD for all premise types in Technical Memorandum No. 2. After receiving and analyzing the customer data provided by all seven member agencies, it appears reasonable to develop customer class specific caps rather than a universal cap for all residential customer classes. Based on customer usage patterns for both multi-family and mobile homes, a lower cap seemed more appropriate for these two customer classes. After analyzing all customer data, the proposed class specific caps appear to be more reasonable than a single universal cap.

For this Memorandum, Carollo employed a cap of 400 GPD/account for single family premise types and a cap of 300 GPD/account for both multi-family and mobile home premise types. The caps are approximately double the median flow values, which are

based on 2010 – 2012 winter water consumption data, for the respective premise types of the different agencies. The methodology for arriving at the different caps is similar to the methodology used in Technical Memorandum No.2 (double the median flow values). This approach attempts to eliminate anomalous account recordings. However, it does not recognize accounts that consume over 400 gpd for single family premise types and 300 gpd for both multi-family and mobile home premise types.

The premise type specific cap was found to be a reasonable method for eliminating unreasonably high data points that would otherwise skew the results. Applying a premise type specific cap across the different premise types has the advantage of consistency and does not favor one agency over the other. The caps and the distribution of the 2010 – 2012 data points for single family, multi-family and mobile home premise types can be seen in Figure 2.3, Figure 2.4 and Figure 2.5.

Figure 2.3Single-Family GPD Histogram (2010 – 2012)

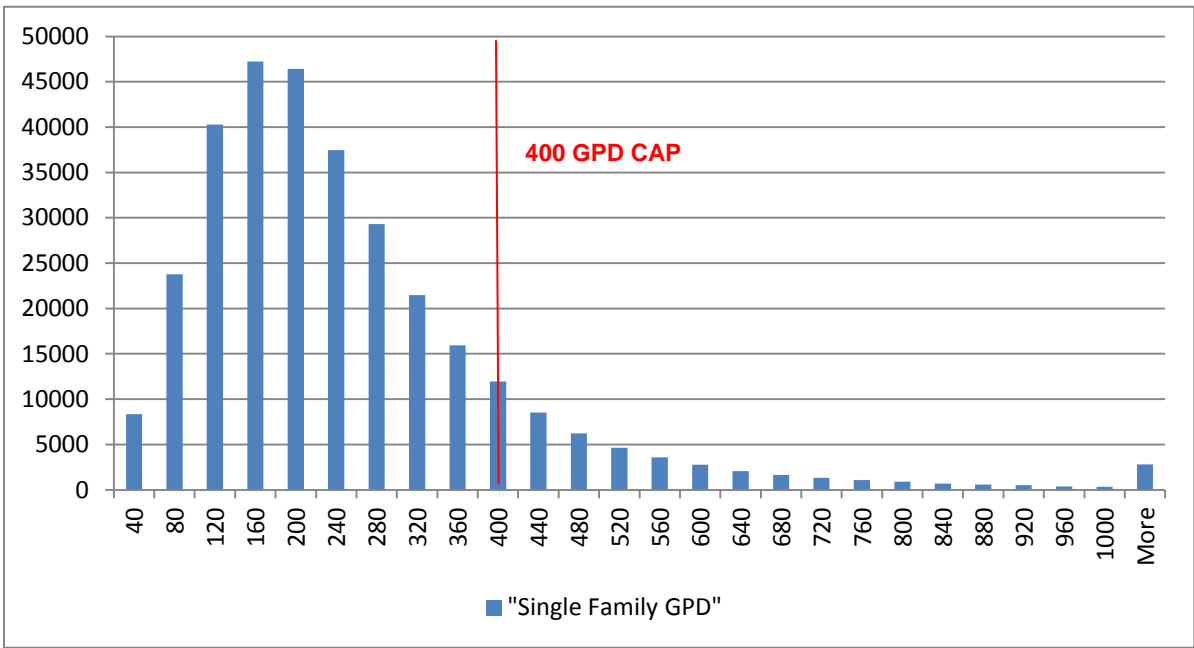


Figure 2.4 Multi-Family GPD Histogram (2010 – 2012)

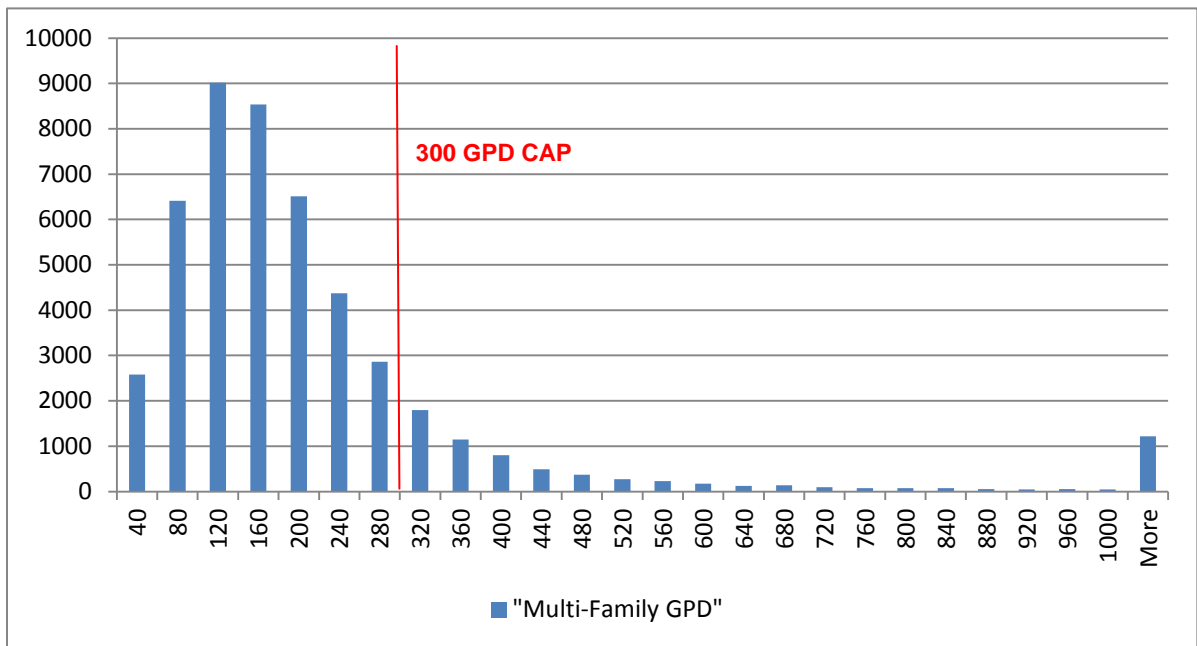
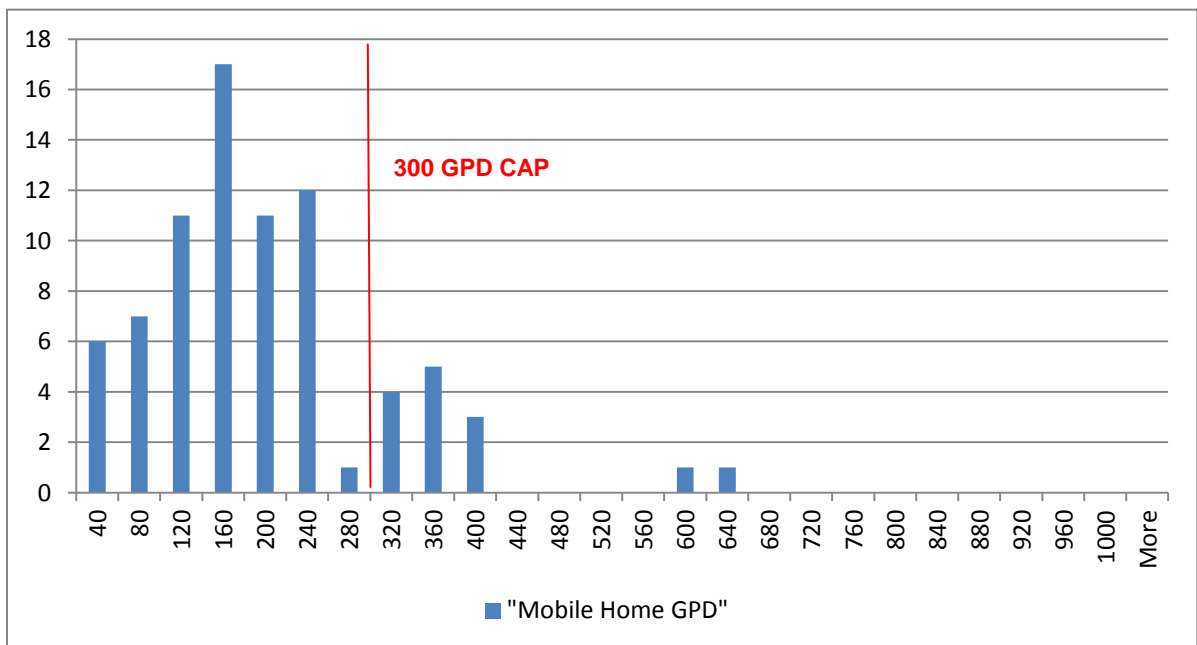


Figure 2.5 Mobile Home GPD Histogram (2010 – 2012)



2.2.3 Per Capita Flow Rate Methodology

Per-capita flow rates are based on residential household sizes as determined by the US Census Bureau 2012 American Community Survey (ACS). Specifically, Table B25033 (Total Population in Occupied Housing Units by Tenure by Units in Structure) and Table

B25032 (Tenure by Units in Structure) provide population and housing unit estimates for each census tract located in Santa Clara County. The two tables contain 5-year estimates, and thus were considered the most appropriate to use for this study since they contained the largest sample size. The population and housing unit estimates were used to calculate residential household sizes for each premise type for the different agencies as well as Santa Clara County. Table 2.5 presents the findings of this analysis.

Once the per unit flow rates and the household sizes were obtained, a per capita flow rate for each premise type for the different agencies was calculated by dividing the per unit flow rate by the corresponding household size. The results are presented in Table 2.7, Table 2.9, Table 2.9, Table 2.11, Table 2.13, Table 2.15, Table 2.17 and Table 2.19.

Table 2.5 Residential Household Sizes (Number of Persons per Unit) Phase 3 Flow and Load Study City of San José							
Residential Unit Type	City of Milpitas	City of San José	City of Santa Clara	Burbank Sanitary District	County Sanitation District No. 2-3	Cupertino Sanitary District	West Valley Sanitation District
Single Family	3.54	3.34	2.96	2.76	3.63	2.94	2.74
Multi-Family	2.73	2.53	2.26	2.64	3.29	2.47	2.06
Mobile Home	2.24	2.97	2.28	-	2.73	-	1.78

2.2.4 City of Milpitas

The City of Milpitas provided residential winter water consumption from 2005 to 2014 to estimate the City's residential flow rates (to be consistent with San Jose's data, only 2007-2014 was analyzed). The water consumption data already contained the premise type and the number of units for each household. A per unit flow rate was obtained by dividing the water consumption by the number of days between two successive meter reading dates, and dividing again by the number of units for each household. The per unit flow rates for each account for the winter months were then averaged per year. An average residential per unit flow rate, which excluded any flow rate greater than 400 GPD per unit for single family premise types and any flow rate greater than 300 GPD per unit for multi-family premise types, was obtained for both single family and multi-family premise types. The results are presented in Table 2.6.

Table 2.6 City of Milpitas per Unit Flow Rates Phase 3 Flow and Load Study City of San José			
	GPD/Account SF	GPD/Account MF	GPD/Account MH
2007	192	140	Not available due to data inconsistencies
2008	194	143	
2009	184	138	
2010	184	144	
2011	166	132	
2012	188	145	
2013	174	143	
2014	186	145	

Milpitas' mobile home data showed very low per-capita flow rates (approximately 30 GPCD in some years). After a close examination of the mobile home data, Carollo found two issues. The first was that the number of data points was very small, totaling only four accounts. The other issue was that although the consumption values for each account changed significantly from year to year, the number of units was relatively consistent. These issues led to the conclusion that the number of units in the database was incorrect, possibly due to fluctuating vacancies, and the number of data points too small to draw large conclusions. Therefore, Milpitas's mobile home data was not used in this analysis because a statistically significant number of reliable data points were not available. The per capita flow rates for Milpitas are presented in Table 2.7.

Table 2.7 City of Milpitas per Capita Flow Rates Phase 3 Flow and Load Study City of San José			
	GPCD SF	GPCD MF	GPCD MH
2007	54	51	Not available due to data inconsistencies
2008	55	52	
2009	52	51	
2010	52	53	
2011	47	48	
2012	53	53	
2013	49	52	
2014	53	53	

2.2.5 City of San José

For the City of San José, datasets from the San Jose Water Company, San Jose Muni Water and the City of the San José were used to estimate the residential per unit flow rates. The premise types and the number of units for each household were obtained from the City of San José's wastewater billing database and the residential water service points obtained from both the San Jose Water Company and San Jose Muni. Flow rates were obtained from winter water consumption from 2011 to 2014, provided by the San Jose Water Company as well as winter water consumption from 2007 to 2014 provided by San Jose Muni.

In general, water accounts that contained winter water consumption data were linked to the corresponding wastewater accounts to determine the premise type as well as the number of units each account serves. The first step involved linking water consumption data with residential water service points through the Water Service Point ID. This allowed the water consumption data to be paired with parcel numbers and addresses.

For San Jose Muni, the parcel numbers were used to link the winter water consumption data with the wastewater billing database obtained from the City of San José. This linkage assigned a premise type and the number of units to San Jose Muni's winter water consumption data.

For the San Jose Water Company, the addresses were used to link the winter water consumption data with the wastewater billing database obtained from the City of San José. This linkage assigned a premise type and the number of units to the San Jose Water Company's winter water consumption data.

Once the number of units for the winter water consumption data was obtained, a per unit flow rate was calculated by simply dividing the water consumption by the number of days between two successive reading dates, and then dividing again by the number of units for each household. The per unit flow rates for each account for the winter months were then averaged per year. An average residential per unit flow rate, which excluded any flow rate greater than 400 GPD per unit for single family premise types and any flow rate greater than 300 GPD per unit for both multi-family and mobile home premise types, was obtained for single family, multi-family, and mobile home premise types. The results are presented in Table 2.8 and Table 2.9.

Table 2.8 City of San José per Unit Flow Rates Phase 3 Flow and Load Study City of San José			
	GPD/Account SF	GPD/Account MF	GPD/Account MH
2007	223	142	198
2008	217	140	181
2009	214	140	169
2010	202	137	174
2011	183	128	150
2012	220	135	130
2013	187	129	134
2014	206	129	142

Table 2.9 City of San José per Capita Flow Rates Phase 3 Flow and Load Study City of San José			
	GPCD SF	GPCD MF	GPCD MH
2007	67	56	67
2008	65	55	61
2009	64	55	57
2010	61	54	59
2011	55	51	51
2012	66	53	44
2013	56	51	45
2014	62	51	48

2.2.6 City of Santa Clara

The City of Santa Clara provided residential winter water consumption from 2005 to 2014 to estimate the City's residential per unit flow rates (to be consistent with San Jose's data, only 2007-2014 was analyzed). The water consumption data already contained the premise type and the number of units for each household. A per unit flow rate was obtained by dividing the water consumption by the number of days in the month that the meter was read, and dividing again by the number of units for each household. The per unit flow rates for each account for the winter months were then averaged per year. An average residential per unit flow rate, which excluded any flow rate greater than 400 GPD per unit for single family premise types and any flow rate greater than 300 GPD per unit for multi-family premise types, was obtained for both single family and multi-family premise types. Santa Clara does not report any mobile home accounts in the Revenue Program. The results are presented in Table 2.10 and Table 2.11.

Table 2.10 City of Santa Clara per Unit Flow Rates Phase 3 Flow and Load Study City of San José			
	GPD/Account SF	GPD/Account MF	GPD/Account MH
2007	195	152	Not Applicable
2008	189	151	
2009	182	150	
2010	170	146	
2011	173	146	
2012	199	155	
2013	187	152	
2014	198	154	

Table 2.11 City of Santa Clara per Capita Flow Rates Phase 3 Flow and Load Study City of San José			
	GPCD SF	GPCD MF	GPCD MH
2007	66	67	Not Applicable
2008	64	67	
2009	61	67	
2010	58	65	
2011	58	65	
2012	67	69	
2013	63	67	
2014	67	68	

2.2.7 West Valley Sanitation District

West Valley Sanitation District provided data from 2010 to 2012 that had been obtained and processed by RMC Water and Environment as part of WVSD's 2014 Study titled "Residential Wastewater Unit Flow Rate Analysis." Since the number of units and the property type for the winter water consumption was already linked, the per unit flow rate was calculated by dividing the water consumption (in GPD) by the number of units for each household. The per unit flow rates for each account for the winter months were then averaged per year. An average residential per unit flow rate, which excluded any flow rate greater than 400 GPD per unit for single family premise types and any flow rate greater than 300 GPD per unit for both multi-family and mobile home premise types, was obtained for single family, multi-family, and mobile home premise types. The results are presented in Table 2.12 and Table 2.13.

Table 2.12 West Valley Sanitation District per Unit Flow Rates Phase 3 Flow and Load Study City of San José			
	GPD/Account SF	GPD/Account MF	GPD/Account MH
2010	176	136	100
2011	185	146	124
2012	201	153	121

Table 2.13 West Valley Sanitation District per Capita Flow Rates Phase 3 Flow and Load Study City of San José			
	GPCD SF	GPCD MF	GPCD MH
2010	64	66	56
2011	68	71	69
2012	73	74	68

2.2.8 Burbank Sanitary District

Burbank Sanitary District provided data from 2011 to 2013 to estimate the residential per unit flow rates as well as a list of residential accounts. Burbank did not have any mobile homes in the residential accounts provided. Flow rates were obtained from winter water consumption while the property types and the number of units for each household were obtained from the list of residential accounts provided.

In general, water accounts that contained winter water consumption data were linked to the corresponding wastewater accounts to determine the property type as well as the number of units each account serves. The first step involved linking water consumption data with residential accounts through the assessor's parcel number (APN). Once the number of units and the property type for the winter water consumption data was obtained, a per unit flow rate was calculated by dividing the water consumption (in gallons) by the number of days between two successive reading dates, and then dividing again by the number of units for each household. The per unit flow rates for each account for the winter months were then averaged per year. An average residential per unit flow rate, which excluded any flow rate greater than 400 GPD per unit for single family premise types and any flow rate greater than 300 GPD per unit for multi-family premise types, was obtained for both single family and multi-family premise types. The results are presented in Table 2.14 and Table 2.15.

Table 2.14 Burbank Sanitary District per Unit Flow Rates Phase 3 Flow and Load Study City of San José			
	GPD/Account SF	GPD/Account MF	GPD/Account MH
2011	141	120	Not Applicable
2012	160	131	
2013	147	119	

Table 2.15 Burbank Sanitary District per Capita Flow Rates Phase 3 Flow and Load Study City of San José			
	GPCD SF	GPCD MF	GPCD MH
2011	51	45	Not Applicable
2012	58	50	
2013	53	45	

2.2.9 County Sanitation District No. 2-3

County Sanitation District No. 2-3 provided data from 2011 to 2013 to estimate the residential per unit flow rates as well as a list of residential accounts. CSD 2-3 did not have any mobile homes in the residential accounts provided. Flow rates were obtained from winter water consumption while the property types and the number of units for each household were obtained from the list of residential accounts provided.

In general, water accounts that contained winter water consumption data were linked to the corresponding wastewater accounts to determine the property type as well as the number of units each account serves. The first step involved linking water consumption data with residential accounts through the assessor's parcel number (APN). Once the number of units and the property type for the winter water consumption data was obtained, a per unit flow rate was calculated by dividing the water consumption (in gallons) by the number of days between two successive reading dates, and then dividing again by the number of units for each household. The per unit flow rates for each account for the winter months were then averaged per year. An average residential per unit flow rate, which excluded any flow rate greater than 400 GPD per unit for single family premise types and any flow rate greater than 300 GPD per unit for multi-family premise types, was obtained for both single family and multi-family premise types. The results are presented in Table 2.16 and Table 2.17.

Table 2.16 County Sanitation District No. 2-3 per Unit Flow Rates Phase 3 Flow and Load Study City of San José			
	GPD/Account SF	GPD/Account MF	GPD/Account MH
2011	178	153	Not Applicable
2012	209	170	
2013	192	163	

Table 2.17 County Sanitation District No. 2-3 per Capita Flow Rates Phase 3 Flow and Load Study City of San José			
	GPCD SF	GPCD MF	GPCD MH
2011	49	46	Not Applicable
2012	58	52	
2013	53	50	

2.2.10 Cupertino Sanitary District

Cupertino Sanitary District provided data from 2011 to 2013 to estimate the residential per unit flow rates as well as a list of residential accounts. Cupertino did not have any mobile homes in the residential accounts provided. Flow rates were obtained from winter water consumption while the property types and the number of units for each household were obtained from the list of residential accounts provided.

In general, water accounts that contained winter water consumption data were linked to the corresponding wastewater accounts to determine the property type as well as the number of units each account serves. The first step involved linking water consumption data with residential accounts through the assessor's parcel number (APN). Once the number of units and the property type for the winter water consumption data was obtained, a per unit flow rate was calculated by dividing the water consumption (in gallons) by the number of days between two successive reading dates, and then dividing again by the number of units for each household. The per unit flow rates for each account for the winter months were then averaged per year. An average residential per unit flow rate, which excluded any flow rate greater than 400 GPD per unit for single family premise types and any flow rate greater than 300 GPD per unit for multi-family premise types, was obtained for both single family and multi-family premise types. The results are presented in Table 2.18 and Table 2.19.

Table 2.18 Cupertino Sanitary District per Unit Flow Rates Phase 3 Flow and Load Study City of San José			
	GPD/Account SF	GPD/Account MF	GPD/Account MH
2011	178	131	Not Applicable
2012	212	164	
2013	195	153	

Table 2.19 Cupertino Sanitary District per Capita Flow Rates Phase 3 Flow and Load Study City of San José			
	GPCD SF	GPCD MF	GPCD MH
2011	60	53	Not Applicable
2012	72	67	
2013	66	62	

2.2.11 Summary of Detailed Flow Analysis

Table 2.20, below, shows a summary of the data collected as part of this study relative to the current revenue program and RMC's 2013 study. The results for this study are shown as an aggregate of 2010 – 2012 data from all the agencies.

Although data was reviewed as far back as 2005, only 2010 – 2012 data was used since the data for WVSD was only obtained for these three years. Although Burbank, CSD 2-3 and Cupertino did not have data for 2010, this year was still used to allow for more data points in this analysis.

The years 2010 – 2012 were used to compare consumption data between the agencies since a review of longer consumption records show that this period had an overall lower winter water use than previous years. In fact, 2011 was substantially lower for all agencies across all residential categories. Lower water use could be indicative of low winter outdoor water use and thus a better representation of sewer flows. This is another reason the study relied on winter water consumption data from 2010 to 2012.

Table 2.20 Residential Flow Rate Comparison Phase 3 Flow and Load Study City of San José							
Basis	Source	GPD/ Household			GPD/Capita		
		SF	MF	MH	SF	MF	MH
Current Revenue Program	1975 Data San José, Santa Clara, Milpitas, CSD 2-3, Burbank, CuSD	219	123	124	65	60	65
	2005 Study WVSD	184	160	157	70	65	65
2013 RMC Study	2011 San José Only				65	55	58
Results from this Study	All Agencies	188	138	139	59 ⁽¹⁾	58 ⁽¹⁾	51 ⁽¹⁾
Note: (1) Based on the residential household size of Santa Clara County (SF – 3.15, MF – 2.37, MH – 2.71)							

2.2.12 Recommended Update to Revenue Program Residential Flow Assumptions

In order to determine the basis for updating the Revenue Program flow assumptions, several alternatives were considered. For each alternative, equity and consistency factors were considered.

- Flow Update Alternative 1: This alternative mirrors the current revenue program's methodology using a single per-capita flow assumption and countywide household densities for each customer class. Essentially, this means that each agency uses the same GPD/household value for each customer category. Because the range of per-capita flows varied among agencies (as shown in previous sections), a standard regional flow of 60 GPCD was selected as a single, representative flow. This flow, 60 GPCD, is consistent with both the results of this study and with indoor water use studies by other agencies (e.g. EBMUD) and industry design parameters (i.e., Metcalf & Eddy).
 - Pros: Consistent with most agencies in California and it can be easily administered
 - Cons: Does not consider differences between agencies, especially household densities and water demands that have been shown to vary across the region.
- Flow Update Alternative 2: This alternative is similar to Alternative 1 in that a standard 60 GPCD flow would be applied across all agencies; however, each agency would use unique household densities per the 2012 ACS census information. The result would be a unique overall flow/household for each agency.

- Pros: Acknowledges different densities between agencies
- Cons: May over or under estimate flow for certain agencies because specific density information is used with no corresponding adjustment to per-capita flow rates.
- Flow Update Alternative 3: Alternative 3 is the most detailed approach in that it uses agency-specific per-capita flow rates and densities.
 - Pros: This is perhaps the most equitable and defensible approach.

At a TAC workshop on October 1, 2014, the Agencies selected Alternative 3 as the preferred method because it was the most detailed and equitable. Table 2.21 presents the results of Alternative 3 (the recommended alternative). Detailed results for each alternative can be found in Appendix B. The resulting total residential flow from each agency using the Alternative 3 flow assumptions is shown in Table 2.22.

Table 2.21 Recommended Update to Revenue Program Residential Flow Assumptions Phase 3 Flow and Load Study City of San José			
Single Family	GPCD based on 2010-2012 Consumption Data	Density – 2012 ACS Census	GPD/ Household
Milpitas	51	3.54	181
San José	60	3.34	200
Santa Clara	61	2.96	181
Burbank	55	2.76	152
CSD 2-3	53	3.63	192
CuSD	66	2.94	194
WVSD	68	2.74	186
Multi-Family	GPCD based on 2010-2012 Consumption data	Density – 2012 ACS Census	GPD/ Household
Milpitas	51	2.73	139
San José	53	2.53	134
Santa Clara	66	2.26	149
Burbank	47	2.64	124
CSD 2-3	49	3.29	161
CuSD	60	2.47	148
WVSD	70	2.06	144
Mobile Home	GPCD based on 2010-2012 Consumption data	Density – 2012 ACS Census	GPD/ Household
Milpitas ⁽¹⁾	63	2.24	141
San José	51	2.97	151
Santa Clara	-	2.28	-
Burbank	-	-	-
CSD 2-3	-	2.73	-
CuSD	-	-	-
WVSD	65	1.78	116
Notes: (1) Based on weighted averages; a statistically significant dataset not available for this agency.			

Table 2.22 Total Residential Flow Using the Different Flow Assumptions Phase 3 Flow and Load Study City of San José				
Flow Scenario	Current Revenue Program (MG)	Alternative 1 Standard 60 GPCD Countywide Density (MG)	Alternative 2 Standard 60 GPCD Unique Densities (MG)	Alternative 3 Unique GPCD Unique Densities (MG)
Milpitas	1,324	1,248	1,403	1,198
San José	20,362	19,374	20,604	19,727
Santa Clara	2,669	2,685	2,543	2,706
Burbank	104	98	94	81
CSD 2-3	369	319	370	326
CuSD	1,471	1,340	1,281	1,380
West Valley	2,744	2,735	2,372	2,704
Total	29,044	27,800	28,666	28,122

2.3 Residential Customer Classifications

San José, Santa Clara, and the Tributary Agencies use single-family, multi-family, and mobile home classifications to distribute O&M costs in the Revenue Program. Carollo investigated how San José, Santa Clara, and Milpitas classify each of the residential customers into each of these three groups.

In many cases, the billing data was not resolute enough to distinguish between special housing types. Instead, Carollo depended on municipal code definitions or a sampling analysis to place each of the special cases into one of the Revenue Program classifications. The sampling analysis consisted of comparing several multi-family data samples using Google Earth to the billing database classification. The results of this analysis are presented in the Table 2.23.

Ideally, each agency would use the same customer classification definitions. However, the overall discrepancies are relatively minor and potential equity discrepancies are at least partially mitigated by using each agency's unique consumption data to determine residential sewer flow rates (this is the approach recommended in Section 2.2.12). For example, Santa Clara classifies some customers as multi-family that other agencies would not consider multi-family. However, the average multi-family flows determined for Santa Clara accounts for this discrepancy and Santa Clara would pay accordingly.

Table 2.23 Residential Premise Types Phase 3 Flow and Load Study City of San José			
Special Residential Type	San José	Santa Clara	Milpitas
Townhomes	A townhouse falls within the definition of a single family residence under San José Municipal Code Section 15.12.460, as it is designed, improved or used as a residence for one family only and does not fall into the category of a two-family residential, multiple-family residential or a residential condominium, which are also specifically defined in Section 15.12.460.	Based on a sampling analysis, Carollo found that Santa Clara classifies townhomes as multi-family units. This is consistent with Santa Clara's 2009 Wastewater Rate Study.	Based on a small sample analysis, Carollo found that Milpitas classifies townhomes as multi-family units.
Duplex	"Two-family premises" are combined with multi-family dwellings in San José's rate resolution. However, a duplex may be considered single family if it has two separate water meters.	Based on a sampling analysis, Carollo found that Santa Clara classifies duplexes as multi-family units. This is consistent with Santa Clara's 2009 Wastewater Rate Study.	Based on a sampling analysis, Carollo found that Milpitas classifies duplexes as multi-family units.
Assisted Living	Carollo found no indication that this category is associated with a residential dwelling unit type (it is considered non-residential)	Based on Santa Clara's billing database, assisted living facilities are classified as multi-family dwellings in the wastewater database. This includes the following NAICS codes: 623210 and 623312.	Carollo found no indication that this category is associated with a residential dwelling unit type (it is considered non-residential)
Rooming, Boarding Houses, Dormitories	Carollo found no indication that this category is associated with a residential dwelling unit type (it is considered non-residential)	Based on Santa Clara's billing database, boarding units are classified as multi-family dwellings in the wastewater database. This includes the NAICS codes 721310.	Carollo found no indication that this category is associated with a residential dwelling unit type (it is considered non-residential)

3.0 RESIDENTIAL LOAD CONSIDERATIONS

San José, Santa Clara, and the Tributary Agencies use consistent concentrations for residential BOD, TSS, and NH₃ discharges. Because the Agencies use different assumptions about the number of persons/dwelling unit and per-capita consumption, the calculated total loading (lbs/month or lbs/year) from each residential household is different as show in Table 3.1. Despite these differences, the Agencies are using concentrations (mg/L) that are consistent with industry practices. Without actual residential monitoring, using consistent concentrations (mg/L) is a defensible and reasonable approach. Therefore, no changes to residential strength assumptions are recommended at this time.

Table 3.1 Comparison of Residential Wastewater Strength Assumptions Used in the Revenue Program Phase 3 Flow and Load Study City of San José							
	Flow gpd/ Capita	BOD		TSS		NH ₃	
		mg/L	Lbs/ capita/ month	mg/L	Lbs/ capita/ month	mg/L	Lbs/ capita/ month
Single-Family							
All Agencies Except WVSD	65	250	4.13	250	4.13	35	0.58
WVSD	70	250	4.44	250	4.44	35	0.62
Multi-Family							
All Agencies Except WVSD	60	250	3.81	250	3.81	35	0.53
WVSD	65	250	4.13	250	4.13	35	0.58
Mobile Home							
All Agencies Except WVSD	65	250	4.12	250	4.12	35	0.58
WVSD	65	250	4.12	250	4.12	35	0.58

4.0 NON-RESIDENTIAL LOAD ASSUMPTIONS

Currently, the Agencies use Flow, BOD, TSS, and NH₃ to characterize non-residential wastewater strengths. The member agencies each employ their own set of loading assumptions. Often, these assumptions are not the same. In instances where there is no evidence to support these differences, it may more appropriate to rely on standard loading assumptions across customer types to complete the wastewater strength assessment. Carollo analyzes this alternative approach in Section 4.2.

4.1 Non-Residential Working Days

The number of working days for certain non-residential classifications is used in the revenue program to convert the total volume of sewage in each billing cycle (based on consumption data) to peak flow rate that is used for allocating capital costs in the Revenue Program. Carollo reviewed the working days assumptions used in the revenue program and found that the Agencies generally use a consistent set of assumptions that are based on common industrial workweek classifications:

- 261 Days: 5-Day workweek.
- 253 Days: 5-Day workweek with the most common 8 holidays off.
- 286 Days: 5-Day workweek with 1/2 day on Saturday.
- 278 Days: 5-Day workweek with 1/2 day on Saturday and the most common 8 holidays off.
- 313 Days: 6-Day workweek.
- 305 Days: 6-Day workweek with the most common 8 holidays off.
- 274 Days: "6/2" Schedule with 6 days on followed by 2 days off (more common in industrial practices).

Other specific schedules are applied on a per-household basis. Because the working day assumptions for a specific industrial classification may vary across cities and between businesses, it is valid for the Revenue Program to use a broad range of assumptions. Therefore, there are no specific recommendations for updating the working day assumptions in the Revenue Program.

4.2 Summary of Non-Residential Load Analysis

As described in Section 4.0, each agency employs its own set of loading assumptions for BOD, TSS, and NH_3 per non-residential customer type. These non-residential customers do not include monitored customers whose wastewater is actually measured. The other non-residential customers fall within Standard Industry Classification (SIC) Codes. In many cases, the loading assumptions are similar or identical for SIC codes in the Agencies. However, Agencies have for select SIC codes, employed loading assumptions that are different, believing that their customers actual load values deviate from the rest of the county's. These differences can lead to a disparity between how different customers, with similar actual load values, in the same SIC code, are charged by different agencies. Table 4.1 shows a sampling of BOD loading assumptions for a few SIC codes across each agency. The sampling of BOD loading assumptions listed in Table 4.1 illustrates the fact that the Agencies occasionally, but not always, employ different loading assumptions.

**Table 4.1 Examples of Current Agency BOD Load Assumptions
Phase 3 Flow and Load Study
City of San José**

SIC Code	SIC Description	Burbank	CSD 2-3	CuSD	Milpitas	San José	Santa Clara	WVSD
2600	Paper and allied products					550	1,250	
2700	Printing and publishing			250		250		250
2800	Chemicals and allied products					130	360	
5812	Eating places	1,250	1,250	1,250	1,250	1,042		1,250
7011	Hotels and motels		310	405	310	310		310
7021	Rooming and boarding houses			250		310		
7200	Personal services				150		150	
7300	Business services	130	130	130		130	130	130

Where Agencies' loading assumptions differed, Carollo developed a single loading assumption for each SIC code in order to simplify the rate calculation process, and reduce the potential rate disparity between different customers from different agencies in the same SIC code. These values were derived from simple averages of the values from each agency. The proposed single BOD loading assumption updates are shown in Table 4.2 for the same set of SIC codes that were shown Table 4.1. A complete list of the current and proposed single value loading assumptions for all agencies is included in Appendix A.

**Table 4.2 Single BOD Loading Assumption per SIC
Phase 3 Flow and Load Study
City of San José**

Single BOD Loading Assumption per SIC		
SIC Code	SIC Description	Proposed BOD mg/l
2600	Paper and allied products	900
2700	Printing and publishing	250
2800	Chemicals and allied products	245
5812	Eating places	1215
7011	Hotels and motels	329
7021	Rooming and boarding houses	280
7200	Personal services	150
7300	Business services	130

One of the goals in developing the single SIC code loading assumption across all agencies was to have values that would preserve county-wide revenue neutrality, and also revenue neutrality for each individual Agency. In order to test whether revenue neutrality results from the single SIC code, Carollo compared the two revenue estimates for each SIC code for each Agency. One set of estimates was based on current loading assumptions used by each Agency. The second set of estimates was based on proposed single values for each SIC code, applied uniformly across Agencies. Table 4.3 presents the shifts in Agency revenue produced by the proposed loading assumptions.

Table 4.3 Impact of Standardizing Countywide Non-residential Loading Assumptions Phase 3 Flow and Load Study City of San José					
Agency	Current	% Share	Proposed	% Share	Change in % Share
Burbank	\$8,046	0.05%	\$8,006	0.05%	0.00%
CSD 2-3	35,591	0.23%	35,868	0.23%	0.00%
CuSD	1,034,398	6.76%	1,023,872	6.67%	-0.09%
Milpitas	1,391,443	9.09%	1,395,183	9.09%	-0.01%
San José	8,848,846	57.81%	8,898,703	57.94%	0.13%
Santa Clara	2,624,086	17.14%	2,627,020	17.10%	-0.04%
West Valley	1,364,344	8.91%	1,369,603	8.91%	-0.00%
Total	\$15,306,755		\$15,358,255		

As illustrated in Table 4.3, in aggregate, by implementing common loading assumptions across Agencies there is no shift in cost allocation between the respective Agencies. However, doing so would create a shift on an individual customer basis. Consequently, while Carollo believes that common loading assumptions across agencies would be beneficial, it should be implemented at the time that a sampling study is undertaken.

5.0 WINTER VERSUS ANNUAL NON-RESIDENTIAL FLOW ASSUMPTIONS

San José, Santa Clara, and the Tributary Agencies determine sewage flow from non-residential customers based on water consumption and, in some cases, a Return to Sewer Percentage is applied so that customers are billed a percentage of their metered water use. Specific methodologies for determining sewer flows from non-residential customers are as follows²:

- San José: Sewage flow is based on **winter** consumption data and a Return to Sewer Percentage is applied to approximately 164 non-residential customers over a variety of commercial types. Winter consumption data is defined as January, February, and

² Some exceptions may apply to specific “monitored” non-residential customers.

March in the annual Sanitary Sewer Service and Use Charges Resolution. Most reductions are applied to institutional classifications (schools, colleges, etc), medical centers, business parks, and (to a lesser extent) restaurants, hotels, motels, and boarding facilities. Return to Sewer Percentages range from 2 percent to 99 percent.

- Santa Clara: Sewage flow is based on **annual** water use and a Return to Sewer Percentage is applied to all non-residential classifications ranging from 70 percent to 90 percent. Schools are set at 24 percent and churches are set at 35 percent of meter water use to account for potential outdoor irrigation.
- WVSD: Sewage flow is based on **annual** water use. Winter consumption data and a Return to Sewer Percentage ranging from 40 to 99 is applied to approximately 158 non-residential customers over a variety of commercial types. In special circumstances, fixed consumption data is applied to approximately 33 non-residential customers.
- Burbank, CSD 2-3, and CuSD estimate non-residential sewage flows based on **annual** consumption data. For some non-residential customers, a Return to Sewer Percentage of 50 percent to 90 percent is applied. These factors are determined on an individual basis. For a few cases, parks for example, only 10 percent of the water use is assumed to return to the sewer. Newer developments install irrigation meters to separate exterior usage from indoor usage. In these cases, 100 percent of the metered indoor water usage is assumed returned to the sewer.
- Milpitas: Sewage flow is based on **annual** water use. Percent reduction factors are applied to only a handful of non-residential customers.

5.1 Winter Versus Annual Non-Residential Analysis

For non-residential water consumption, a comparison was made between estimated sewer flow based on 1) annual water consumption using Return to Sewer Percentages; and 2) the annualized winter water consumption without the application of the Return to Sewer Percentages.

5.1.1 Data Sources

Non-residential water consumption data was obtained from the San Jose Water Company, San Jose Muni Water, the City of Santa Clara, and the City of Milpitas. For the San Jose Water Company, non-residential water consumption data from January 2012 to March 2014 was available. For San Jose Muni Water, non-residential water consumption data from July 2006 to April 2014 was available. For the City of Santa Clara, water consumption data for the months of January, February, and March from 2005 to 2014 was available. For the City of Milpitas, water consumption data from January 2005 to June 2014 was available.

Other information used in this study includes the non-residential water service points obtained from both the San Jose Water Company and San Jose Muni Water. A sewer bill code report from the City of Santa Clara and water diversion rates for certain non-

residential water users obtained from the City of Milpitas were also used. The datasets all contain reduction factors that are used to indicate how much of the water usage is estimated to return to the sewers.

5.1.2 Sewer Flows based on Annual Water Consumption

Estimating sewer flows based on annual water consumption involved calculating estimated annual water consumption, with the application of the Return to Sewer Percentages. With the exception of the City of Santa Clara, the annual water consumption was estimated based on consumption data from January to December (all year).

For the City of Milpitas, non-residential water users were assigned Return to Sewer Percentages based on the information provided by the City of Milpitas. Approximately ten non-residential accounts had Return to Sewer Percentages assigned to them. The values ranged from 21 percent to 77 percent. It was assumed that the remaining non-residential accounts had a Return to Sewer Percentage of 100 percent.

For each non-residential account, using data from January to December, an average per day flow rate, which incorporates the Return to Sewer Percentages, was calculated per year. These per day flow rates were then multiplied by 365 days to obtain a yearly consumption, in million gallons (MG) of water. The estimated annual water consumption with the Return to Sewer Percentages is the sum of the estimated annual water consumption of all the non-residential water accounts. The City of Milpitas provided water consumption data from 2006 to 2013. The results are presented in Table 5.1.

For the City of San José, data was available from both the San Jose Water Company and San Jose Muni Water. Calculations were based on San Jose Muni Water consumption data from 2007 to 2013 and San Jose Water Company water consumption data from 2012 to 2013. The non-residential water consumption data was linked to the non-residential water service points to obtain the premise type as well as the corresponding Return to Sewer Percentage. The Return to Sewer Percentages ranged from approximately 1% to 100%. Any water consumption data not linking to a premise type and/or not having information regarding a Return to Sewer Percentage was excluded from the analysis.

Once the Return to Sewer Percentages were assigned, for each non-residential account, using data from January to December, an average per day flow rate, which incorporates the Return to Sewer Percentages, was calculated per year. These per day flow rates were then multiplied by 365 days to obtain a yearly consumption in million gallons (MG) of water. For each Agency, Table 5.1 presents the sum of estimated annual water consumption (including Return to Sewer Percentages) of all non-residential water accounts.

Table 5.1 Estimated Annual Consumption (MG) with Return to Sewer Percentages Phase 3 Flow and Load Study City of San José			
	City of Milpitas	City of San José⁽¹⁾	City of Santa Clara
2006	1,960		
2007	1,641	849	
2008	1,699	881	
2009	1,401	860	
2010	1,412	839	
2011	1,445	843	2,504
2012	1,436	5,518	2,853
2013	1,575	5,525	2,774
Note: (1) 2007-11 includes only San Jose Muni Water data, while 2012 and 2013 include San Jose Water Company data as well.			

For the City of Santa Clara, the estimated annual water consumption was not calculated based on water consumption data. Instead, the estimated annual water consumption for the different years was obtained from the Revenue Program. Santa Clara's annual water consumption in the Revenue program is based on annual water use data with the application of a Return to Sewer Percentage applied to non-residential classifications. The Return to Sewer Percentage ranges from 70 to 90 percent.

5.1.3 Sewer Flows based on Annualized Winter Water Consumption

Sewer flows were estimated based on annualized winter water consumption by extrapolating annual water consumption from winter water consumption without the application of the Return to Sewer Percentages. Winter water consumption was defined as water consumed during January to March.

For the City of Milpitas, the annualized winter water consumption did not apply any Return to Sewer Percentages. The average per day flow rate for each non-residential account was calculated based on data from January to March, without incorporating any Return to Sewer Percentages. These per day flow rates were then multiplied by 365 days to obtain a yearly consumption, measured in million gallons (MG) of water. The annualized winter water consumption without the Return to Sewer Percentages is the sum of the annualized winter water consumption, without the application of the Return to Sewer Percentages, of all the non-residential water accounts. The City of Milpitas provided water consumption data from 2006 to 2013. The results are presented in Table 5.2.

For the City of San José, the annualized winter water consumption did not apply any Return to Sewer Percentages. Data was available from both the San Jose Water Company and San Jose Muni Water. Calculations were based on San Jose Muni Water consumption data

from 2007 to 2013 and San Jose Water Company water consumption data from 2012 to 2013. For each non-residential account, using data from January to March, an average per day flow rate, which did not incorporate any Return to Sewer Percentages, was calculated per year. These per day flow rates were then multiplied by 365 days to obtain a yearly consumption, in million gallons (MG) of water. The annualized winter water consumption without the Return to Sewer Percentages is the sum of the annualized winter water consumption, without the application of the Return to Sewer Percentages, of all the non-residential water accounts. The results are presented in Table 5.2.

For the City of Santa Clara, the annualized winter water consumption did not apply any Return to Sewer Percentages. The average per day flow rate for each non-residential account was calculated based on data from January to March without incorporating any Return to Sewer Percentages. These per day flow rates were then multiplied by 365 days to obtain a yearly consumption, measured in million gallons (MG) of water. The annualized winter water consumption without the Return to Sewer Percentages is the sum of the annualized winter water consumption, without the application of the Return to Sewer Percentages, of all the non-residential water accounts. The City of Santa Clara provided water consumption data from 2011 to 2013 to produce the results presented in Table 5.2.

Table 5.2 Estimated Annualized Winter Consumption (MG) without Return to Sewer Percentages Phase 3 Flow and Load Study City of San José			
	City of Milpitas	City of San José	City of Santa Clara
2006	452		
2007	1,204	696	
2008	1,223	684	
2009	1,057	692	
2010	1,139	633	
2011	957	678	2,530
2012	1,143	3,944	2,491
2013	1,026	4,378	2,492

5.2 Winter Versus Annual Summary of Findings

The results show that in terms of non-residential water consumption, using annual water consumption data to estimate sewer discharges produces a higher water consumption estimate when compared to using annualized winter consumption data. The difference was found to be about 20 to 30 percent for San José and Milpitas, and about 10 to 15 percent for Santa Clara.

For the City of Milpitas, using annual consumption data (with Return to Sewer Percentages) was approximately 27 percent higher, based on the years from 2007 to 2013, than the

annualized winter consumption data without the application of Return to Sewer Percentages. The year 2006 was not factored into this percentage since the water consumption during this year was relatively low and did not seem to be representative of typical non-residential water consumption.

For the City of San José, using annual consumption data (with Return to Sewer Percentages) was approximately 22 percent higher than using annualized winter consumption data, based on the years from 2007 to 2013. The years 2012 and 2013 had significantly higher water consumption when compared to previous years but this is because starting in 2012, water consumption data was available for both San Jose Muni and the San Jose Water Company. Before 2012, only San Jose Muni Water consumption data was available.

For the City of Santa Clara, the estimated annual consumption with the application of Return to Sewer Percentages was approximately 11 percent higher, based on the years from 2011 to 2013, than the annualized winter consumption data without the application of Return to Sewer Percentages. Santa Clara applies aggressive reduction factors to its non-residential customers (relative to the other Tributary Agencies) and this is likely the cause of the smaller difference. For example, all non-residential customers are reduced by at least 90% if there is no separate irrigation meter. Therefore, Santa Clara was considered unique and, across the region, a difference of about 20 to 30 percent between the two non-residential sewer flow methodologies is more representative of the RWF Agencies.

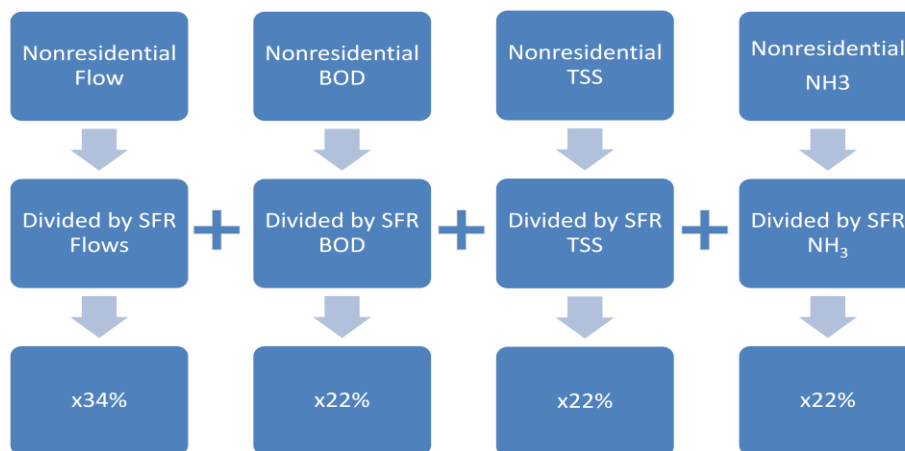
6.0 NON-RESIDENTIAL CLASSIFICATIONS

Between Agencies, there is variability in the assumed wastewater loading coming from a single class of non-residential customers. This variability was previously discussed in Section 4.2. There can be benefit in standardizing assumed loads when no Agency can show that their assumed customer class wastewater loads are significantly different the other Agencies. As Table 4.3 indicated, this method did not preserve revenue neutrality.

This section describes the potential benefit of classifying non-residential customers into groups based on common strength ratios. It will also describe the impact of this grouping method on agency cost allocation.

In order to simplify the administrative process while maintaining consistency in agency cost allocation, non-residential customer types can be grouped based on their respective Equivalent Residential Units (ERU). An ERU is the measure of customer's impact on the wastewater system as a ratio to the impact of a typical single-family residence. The ERU takes into account weighting factors such as the customer's flow, BOD, TSS, and NH₃ loadings. The ERU calculation process is presented in **Figure 6.1**.

Figure 6.1 ERU Calculation Process



The customer component inputs are represented in the top row of **Figure 6.1**. The second row represents the amount of flow, BOD, TSS, and NH₃ contributed by a single-family residence. The percentage factors in the bottom row represent the standard component weighting values. These weighting values are based on the assumed allocation of O&M and replacement capital costs from the treatment and collection facilities. An example of an ERU calculation is presented in Table 6.1.

Table 6.1 Example ERU Calculation Phase 3 Flow and Load Study City of San José			
Customer Flow 300 gpd	Customer BOD 550 mg/L	Customer TSS 450 mg/L	Customer NH₃ 80 mg/L
300 divided by 200 (typical SFR flow)	550 divided by 250 (typical SFR BOD)	450 divided by 250 (typical SFR TSS)	80 divided by 35 (typical SFR NH ₃)
x34%	x22%	x22%	x22%
Flow factor = .51	BOD factor = .48	TSS factor = .40	NH ₃ factor = .50
Sum of component factors = Customer's ERU value = 1.89 ERUs			

Once every customer's ERU factor is calculated, they are sorted and grouped based on a set of ERU per unit ranges. These ranges put customers with similar impacts on the wastewater system within the same group. Once grouped, each customer is assigned a strength factor derived from the average ERU per unit factor of the whole group. This assigned ERU/unit value replaces the customer's calculated ERU/unit value. This value is used to calculate the cost associated with each customer's discharge and the total cost for each city. While the ERU/unit value still needs to be calculated for each customer, the assigned value simplifies the agency cost calculations because it reduces the number of non-residential customer categories. Each group's range and assigned ERU per unit value are presented in Table 6.2.

Table 6.2 Strength Groupings Phase 3 Flow and Load Study City of San José	
Strength Groupings	
ERU/unit Range	Assigned ERU/unit value
0<A≤1	0.6
1<B≤4	2.2
4<C≤7	5
7<D≤15	11
15<E≤30	20
30<F≤100	40
100<G	300

Table 6.3 presents the shifts in member agency cost allocation produce by applying the proposed grouping ranges. The right-hand column indicates that, for the most part, revenue neutrality is preserved using the grouping methodology.

Table 6.3 Impact of Grouping on Agency Cost Allocation Phase 3 Flow and Load Study City of San José					
Agency	Current Allocation		Allocation with Grouping		Change in %
	Total Share	% Share	Total Share	% Share	
Burbank	\$8,046	0.05%	\$6,956	0.05%	-0.01%
CSD 2-3	35,591	0.23%	36,539	0.24%	0.01%
CuSD	1,034,398	6.76%	934,611	6.10%	-0.66%
Milpitas	1,391,443	9.09%	1,437,309	9.38%	0.29%
San José	8,848,846	57.81%	8,809,259	57.48%	-0.33%
Santa Clara	2,624,086	17.14%	2,649,849	17.29%	0.15%
West Valley	1,364,344	8.91%	1,450,652	9.47%	0.55%
Total	\$15,306,755		\$15,325,175		

The method of grouping customers by ERU factors both simplifies the administrative process and maintains consistency in agency cost allocation. Carollo recommends that the member agencies implement the proposed grouping methodology.

7.0 MASS BALANCE

A mass balance can be performed in order to evaluate the reasonableness of the current customer data assumptions for flow, BOD, TSS, and NH₃ relative to measured influent at the plant, as well as the assumptions for proposed changes to these components.

The mass balance compares the measured flow, BOD, TSS, and NH₃ entering the plant to the calculated values that result from the current rate calculation process, as well as the calculated values from the proposed alternatives.

The results of the mass balance are presented in Table 7.1. The first row of the table shows the measured values for flow, BOD, TSS, and NH₃ at the plant. The second row in the table shows the calculated values based on the flow and loading assumptions used in the current revenue plan. Subsequent rows show the calculated flow and load values for the various alternatives that are presented in this TM.

Table 7.1 Mass Balance Phase 3 Flow and Load Study City of San José				
Mass Balance	Flow (mgd)	BOD (lbs/day)	TSS (lbs/day)	NH₃ (lbs/day)
Influent Plant Loading	113 ⁽¹⁾	273,302 ⁽²⁾	260,579 ⁽²⁾	29,347 ⁽²⁾
Current Calculated Total	115	192,782	181,459	24,553
Calculated Total with Non-Residential Groupings	115	192,806	181,473	24,554
Calculated Total with Proposed Residential Assumptions ⁽³⁾	113	192,782	181,459	24,553
Calculated Total with Proposed Residential Assumptions and Non-Residential Groupings ⁽³⁾	113	192,806	181,473	24,554
Notes: (1) Based on the latest (2013) Report to TPAC on November 6th, 2013. Based on peak dry weather flow that occurred from September 16th - 20th, 2013. (2) Based on influent plant monitoring data from September 16th - 20th, 2013. (3) Proposed Residential Assumptions are calculated under the 400 gpcd cap for SF, 300 gpcd cap for MF, and the 300 gpcd cap for MH.				

Several conclusions can be reached from comparing the different rows in the table.

- The flow values for the current revenue plan as well as all of the alternatives roughly approximate the amount of flow that enters the plant on an aggregate basis.

- The loading values for the current revenue plan understate the amount of BOD, TSS, and NH₃ entering the plant.
- Each of the alternatives presented in this TM present calculated flow, BOD, TSS, and NH₃ values that are almost equal to the values used in the current revenue plan.

Based on these conclusions, the alternatives and their respective flow and loading assumptions are consistent with the current revenue plan. In order to improve the accuracy of the alternatives in relation to the loads measured at the plant, a load sampling evaluation should be undertaken. Such an effort would take several years to complete and could still likely result in a measured versus calculated loads discrepancy of somewhere in the 5 to 15 percent range.

8.0 SUMMARY AND RECOMMENDATIONS

The following sections summarize Carollo's major conclusions and recommendations.

8.1 Residential Flow Assumptions

Residential flow assumptions have not been updated since 1975. Based on the findings of this study and prior studies, the current revenue program residential flow assumptions do not reflect current usage characteristics on an agency by agency basis. Carollo recommends updating these assumptions using a unique flow assumption per household for each Agency and customer classification. The merits of this approach were weighed against several alternatives and discussed at a TAC Workshop on October 1, 2014. This methodology was found to be the most accurate and equitable. Based on this finding, detailed flow assumptions are provided based on winter water consumption data for all the agencies.

To create a unique set of flow assumption for each Agency, Carollo evaluated almost 666,000 consumption records to estimate sewer flows. Winter data was used to estimate sewer flows and Carollo's review of Return to Sewer Percentages shows that this is an industry-accepted approach and relevant to the RWF service area. However, a 400 GPD cap for single family premise types and a 300 GPD cap for both multi-family and mobile home premise types was used to eliminate outliers associated with outdoor irrigation (even in the winter), data integrity issues, as well as issues with linking the number of multi-family and mobile home accounts to the associated water consumption records. The result of this work is an approach that is equitable and defensible and provides the best representation of sewer flows. It also uses a methodology that is simple to update based on future census data and consumption records.

8.2 Residential Strength Parameters

Without actual residential monitoring of residential wastewater strength, following the standard industry practice of assuming consistent concentrations is a defensible and reasonable approach. Therefore, no changes to residential strength assumptions are recommended at this time.

However, because the mass balance resulted in inconsistent loadings at the plant relative to the Revenue Program, it is recommended that the Tributary Agencies conduct a wastewater strength-sampling program. It is unknown whether the cause of the discrepancy is due to residential or non-residential loading assumptions. A residential strength-sampling program should be commissioned first to see if the residential parameters are accurate. A residential sampling program will be easier to implement than one for non-residential customers.

8.3 Non-Residential Flow Analysis

There is no universal industry standard for estimating sewage flows across broad ranges of commercial and industrial classifications. Based on Carollo's experience, winter water usage with a reduction factor, if applicable, is a common approach. It is reasonable that flows from the various non-residential dischargers within the RWF service area will vary (even those with the same SIC designation). However, the methods for calculating those flows for the purposes of allocating costs in the Revenue Program should be consistent.

The major discrepancy among the RWF users is that San José uses winter consumption data to bill non-residential customers, while the City of Santa Clara and the other Tributary Agencies use annual water use with a Return to Sewer Percentage. This study investigated the potential differences caused by these two methods. The results show that using annual water consumption data to estimate sewer discharges produces about 20-30% more sewer flow when compared to using annualized winter consumption data.

Without substantial flow monitoring data, it is not possible to definitively determine which approach is more accurate. Because both approaches are reasonable, it is Carollo's opinion that the decision to use winter vs. annual billing data should be left to each Agency's judgment based on their unique characteristics, customer base, metering capabilities, and data collection abilities.

8.4 Non-Residential Strength Parameters

This study found that not all Agencies use the same non-residential loading assumption for all SIC codes. Although many of the SIC loading assumptions are the same, the study found some discrepancies. Single loading assumptions per SIC code would preserve overall revenue neutrality as well as equity amongst the Agencies. If the Agencies wish to maintain the current policy whereby Agencies have occasionally reported their own loading

assumptions to represent specific SIC codes, we suggest performing a sampling program, for the different SIC codes, where none has been recently performed, in order to develop defensible loading assumptions. As described in Section 4.2, standardizing non-residential customer loading assumptions results in a system that preserves revenue neutrality. Carollo does recommend that the member agencies implement the single value loading assumptions for non-residential customer types once a sampling study is completed.

Additionally, the method described in Section 6.0 of grouping customers by ERU factors both simplifies the administrative process and maintains consistency in agency cost allocation. Using categories that place commercial customers into common wastewater strength ranges may be a more realistic approach as it recognizes that the specific wastewater parameters of each SIC code is not known and is difficult to quantify. Carollo recommends that the Agencies implement the proposed grouping methodology. However, because the current approach is valid and the current parameters align with the State Revenue Program Guidelines, the ERU cost factor methodology should only be considered if the Tributary Agencies agree that the simplified methodology outweighs any administrative burden associated with its implementation.

8.5 Mass Balance Analysis

A mass balance was performed in order to evaluate the reasonableness of the current customer data assumptions for flow, BOD, TSS, and NH_3 relative to measured influent at the plant. It was also conducted to test how proposed changes (identified by this study) would change the mass balance relative to the current revenue program.

The study found that flow values for the current revenue program roughly approximates the amount of flow that enters the plant, but understates the amount of BOD, TSS, and NH_3 entering the plant. Because the mass balance resulted in inconsistent loadings at the plant relative to the Revenue Program, it may be necessary to conduct a wastewater strength-sampling program. It is unknown whether the cause of the discrepancy is due to residential or non-residential loading assumptions. A residential strength-sampling program should be commissioned first to see if the residential parameters are accurate.

Furthermore, the study tested how proposed changes would change the mass balance relative to the current revenue program, and found no inconsistencies. This includes the recommended residential flow assumptions and the non-residential “ERU groupings” described in Section 6.0.

9.0 REVENUE PROGRAM UPDATES

Overall, it is recommended that San José-Santa Clara evaluate the Revenue Program assumptions every 10 years to ensure accuracy and equity. This may include a combination of updating the household densities used to estimate residential sewer flows based on the latest census information and review of water consumption data. It may also

include updating residential and non-residential wastewater strength parameters based on more current loadings data.

APPENDIX A - PRELIMINARY FLOW ANALYSIS

APPENDIX A – COMPARISON OF NON-RESIDENTIAL WASTEWATER STRENGTH

BOD Assumptions used in the Revenue Program (mg/L)

SIC Code	Description	Burbank	CSD 2-3	CuSD	Milpitas	San José	Santa Clara	WVSD	Proposed Countywide Assumptions
1770	Concrete Work					130			130
2000	Food and Kindred Prod						1,120		1120
2011	Meat packing plants					415			415
2020	Dairy Prod					1,130			1130
2050	Bakery Prod					720			720
2084	Wines, brandy					1,870		1,870	1870
2086	Soft Drinks					1,030			1030
2600	Paper and Allied Prod					550	1,250		900
2700	Printing & Publishing			250		250		250	250
2800	Chemicals and Allied Prod					130	360		245
2851	Paints and Allied Prod					130			130
3400	Fabricated Metal Prod					10	10	10	10
3500	Industrial Machinery and Equipment			290		290	290	290	290
3600	Electronic Equipment			30		30	30	30	30
3800	Instruments and related						30		30
3900	Misc Manufacturing Prod					130			130
4225	General warehousing					150			150

SIC Code	Description	Burbank	CSD 2-3	CuSD	Milpitas	San José	Santa Clara	WVSD	Proposed Countywide Assumptions
4953	Refuse Systems					130			130
5261	Retail Nurseries					300			300
5411	Grocery Stores					475			475
5461	Retail bakeries					1,000			1000
5500	Automotive Dealer and Service					180	180		180
5541	Gas Service Station		180	180	180	180		180	180
5800	Eating and Drinking						1,250		1250
5812	Eating	1,250	1,250	1,250	1,250	1,042		1,250	1215
5813	Drinking					200			200
5900	Misc Retail					230			230
6000	Depository Institutions				130				130
6553	Cemetery Developers					150			150
7000	Hotels and other lodging						310		310
7011	Hotels and Motels		310	405	310	310		310	329
7021	Rooming and Boarding			250		310			280
7200	Personal Services				150		150		150
7211	Power Laundries		150	150		150		150	150
7216	Dry-cleaning plants					450			450
7218	Industrial Launderers							670	670
7231	Beauty Shops					150			150
7261	Funeral Services					800			800
7300	Business	130	130	130		130	130	130	130

SIC Code	Description	Burbank	CSD 2-3	CuSD	Milpitas	San José	Santa Clara	WVSD	Proposed Countywide Assumptions
	Services								
7384	Photofinishing Labs					150		160	155
7389	Other Business Services					3		3	3
7500	Auto repair Services						180		180
7521	Automobile Parking	180				130			155
7530	Automotive Repair Shops					180			180
7542	Carwashes			20		20		20	20
7549	Automotive Services					200			200
7832	Movie Theaters					190			190
7990	Misc Recreation		250			200			225
7996	Amusement Parks					130			130
7997	Sports & Clubs					150			150
7999	Other Amusement		180						180
8000	Health Services		180			190	230		200
8200	Educational Services	130		130	130		130	130	130
8211	Elementary and Secondary Schools					130			130
8220	Colleges and Universities					130			130
8300	Social Services		230	230	271	230		230	238
8661	Religious Organizations		250						250
8711	Architectural Services					130			130

TSS Assumptions used in the Revenue Program (mg/L)

SIC CODE	Description	Burbank	CSD 2-3	CuSD	Milpitas	San José	Santa Clara	WVSD	Proposed Countywide Assumptions
1770	Concrete Work					80			80
2000	Food and Kindred Prod						690		690
2011	Meat packing plants					233			233
2020	Dairy Prod					445			445
2050	Bakery Prod					400			400
2084	Wines, brandy					1,200		1,200	1200
2086	Soft Drinks					65			65
2600	Paper and Allied Prod					1,260	560		910
2700	Printing & Publishing			500		500		500	500
2800	Chemicals and Allied Prod					80	720		400
2851	Paints and Allied Prod					80			80
3400	Fabricated Metal Prod					60	60	60	60
3500	Industrial Machinery and Equipment			550		550	550	550	550
3600	Electronic Equipment			15		15	15	15	15
3800	Instruments and related						15		15
3900	Misc Manufacturing Prod					80			80
4225	General warehousing					150			150
4953	Refuse Systems					80			80
5261	Retail Nurseries					280			280

SIC CODE	Description	Burbank	CSD 2-3	CuSD	Milpitas	San José	Santa Clara	WVSD	Proposed Countywide Assumptions
5411	Grocery Stores					475			475
5461	Retail bakeries					600			600
5500	Automotive Dealer and Service					280	280		280
5541	Gas Service Station		280	280	280	280		280	280
5800	Eating and Drinking						560		560
5812	Eating	560	560	560	560	587		560	565
5813	Drinking					200			200
5900	Misc Retail					190			190
6000	Depository Institutions				80				80
6553	Cemetery Developers					150			150
7000	Hotels and other lodging						121		121
7011	Hotels and Motels		121	361	121	121		121	169
7021	Rooming and Boarding			250		121			186
7200	Personal Services				110		110		110
7211	Power Laundries		110	110		110		110	110
7216	Dry-cleaning plants					240			240
7218	Industrial Launderers							680	680
7231	Beauty Shops					150			150
7261	Funeral Services					800			800
7300	Business Services	80	80	80		80	80	80	80
7384	Photofinishing Labs					150		60	105
7389	Other					55		55	55

SIC CODE	Description	Burbank	CSD 2-3	CuSD	Milpitas	San José	Santa Clara	WVSD	Proposed Countywide Assumptions
	Business Services								
7500	Auto repair Services						280		280
7521	Automobile Parking	280				80			180
7530	Automotive Repair Shops					280			280
7542	Carwashes			150		150		150	150
7549	Automotive Services					1,350			1350
7832	Movie Theaters					210			210
7990	Misc Recreation		250			200			225
7996	Amusement Parks					80			80
7997	Sports & Clubs					150			150
7999	Other Amusement		280						280
8000	Health Services		250			90	85		142
8200	Educational Services	100		100	100		100	100	100
8211	Elementary and Secondary Schools					100			100
8220	Colleges and Universities					100			100
8300	Social Services		85	85	142	85		85	96
8661	Religious Organizations		250						250
8711	Architectural Services					80			80

NH³ Assumptions used in the Revenue Program (mg/L)

SIC CODE	Description	Burbank	CSD 2-3	CuSD	Milpitas	San José	Santa Clara	WVSD	Proposed Countywide Assumptions
1770	Concrete Work					11			11
2000	Food and Kindred Prod						-		10
2011	Meat packing plants					2			7
2020	Dairy Prod					20			20
2050	Bakery Prod								20
2084	Wines, brandy					3		3	3
2086	Soft Drinks								11.5
2600	Paper and Allied Prod					7	10		9
2700	Printing & Publishing			-				-	11
2800	Chemicals and Allied Prod					11	-		11
2851	Paints and Allied Prod					11			11
3400	Fabricated Metal Prod					1	1	1	1
3500	Industrial Machinery and Equipment			-			-	-	5
3600	Electronic Equipment			30		30	15	30	26
3800	Instruments and related						15		15
3900	Misc Manufacturing Prod					11			11
4225	General warehousing					11			11
4953	Refuse Systems					11			11
5261	Retail Nurseries					11			11

SIC CODE	Description	Burbank	CSD 2-3	CuSD	Milpitas	San José	Santa Clara	WVSD	Proposed Countywide Assumptions
5411	Grocery Stores					11			11
5461	Retail bakeries					11			11
5500	Automotive Dealer and Service					11	11		11
5541	Gas Service Station		-	-	-			-	11
5800	Eating and Drinking						10		10
5812	Eating	10	10	10	10	11		10	10
5813	Drinking					11			11
5900	Misc Retail					11			11
6000	Depository Institutions				11				11
6553	Cemetery Developers					11			11
7000	Hotels and other lodging						7		7
7011	Hotels and Motels		7	21	7	7		7	10
7021	Rooming and Boarding			35		11			23
7200	Personal Services				5		5		5
7211	Power Laundries		5	5		5		5	5
7216	Dry-cleaning plants					11			11
7218	Industrial Launderers							2	2
7231	Beauty Shops					11			11
7261	Funeral Services					11			11
7300	Business Services	11	11	11		11	11	11	11
7384	Photofinishing Labs							-	11

7389	Other Business Services							-	11
7500	Auto repair Services						-		11
7521	Automobile Parking	-				11			11
7530	Automotive Repair Shops								11
7542	Carwashes			-				-	
7549	Automotive Services								11
7832	Movie Theaters					11			11
7990	Misc Recreation		35			11			23
7996	Amusement Parks					11			11
7997	Sports & Clubs					11			11
7999	Other Amusement		-						23
8000	Health Services		-			11	15		13
8200	Educational Services	30		30	30		30	30	30
8211	Elementary and Secondary Schools					30			30
8220	Colleges and Universities					30			30
8300	Social Services		15	15	13	15		15	15
8661	Religious Organizations		35						35
8711	Architectural Services					11			11

**APPENDIX B – 2014 FLOW AND LOADS STUDY –
RESIDENTIAL FLOW ASSUMPTIONS ALTERNATIVES**

Agency		Current Assumptions			Alternative 1 Assumptions			Alternative 2 Assumptions			Alternative 3 Assumptions		
SFR	# of units	gpcd	Cap/unit	gpd	gpcd	Cap/unit	gpd	gpcd	Cap/unit	gpd	gpcd	Cap/unit	gpd
Milpitas	12,229	65	3.37	2,678,762	60	3.15	2,311,281	60	3.54	2,597,440	51	3.54	2,207,284
San José	181,039	65	3.37	39,656,593	60	3.15	34,216,371	60	3.34	36,280,216	60	3.34	36,280,216
Santa Clara	17,103	65	3.37	3,746,412	60	3.15	3,232,467	60	2.96	3,037,493	61	2.96	3,088,118
Burbank	946	65	3.37	207,221	60	3.15	178,794	60	2.76	156,658	55	2.76	143,603
CSD 2-3	4,545	65	3.37	995,582	60	3.15	859,005	60	3.63	989,901	53	3.63	874,413
CuSD	15,390	65	3.37	3,371,180	60	3.15	2,908,710	60	2.94	2,714,796	66	2.94	2,986,276
West Valley	31,496	70	2.63	5,798,414	60	3.15	5,952,744	60	2.74	5,177,942	68	2.74	5,868,335
SFR Subtotal				56,454,164			49,659,372			50,954,445			51,448,783

Agency		Current Assumptions			Alternative 1 Assumptions			Alternative 2 Assumptions			Alternative 3 Assumptions		
MFR	# of units	gpcd	Cap/unit	gpd	gpcd	Cap/unit	gpd	gpcd	Cap/unit	gpd	gpcd	Cap/unit	gpd
Milpitas	7,143	60	2.05	878,589	60	2.37	1,015,735	60	2.73	1,168,994	51	2.73	994,520
San José	120,294	60	2.05	14,796,162	60	2.37	17,105,807	60	2.53	18,244,560	53	2.53	16,130,222
Santa Clara	28,998	60	2.05	3,566,754	60	2.37	4,123,516	60	2.26	3,928,669	66	2.26	4,352,342
Burbank	633	60	2.05	77,859	60	2.37	90,013	60	2.64	100,179	47	2.64	78,543
CSD 2-3	114	60	2.05	14,022	60	2.37	16,211	60	3.29	22,484	49	3.29	18,378
CuSD	5,366	60	2.05	660,018	60	2.37	763,045	60	2.47	794,541	60	2.47	795,241
West Valley	10,287	65	2.46	1,644,891	60	2.37	1,462,811	60	2.06	1,270,354	70	2.06	1,483,385
MFR Subtotal				21,638,295			24,577,137			25,529,781			23,825,631

Agency		Current Assumptions			Alternative 1 Assumptions			Alternative 2 Assumptions			Alternative 3 Assumptions		
MH	# of units	gpcd	Cap/unit	gpd	gpcd	Cap/unit	gpd	gpcd	Cap/unit	gpd	gpcd	Cap/unit	gpd
Milpitas	570	65	1.9	70,395	60	2.71	92,682	60	2.24	76,608	63	2.24	80,438
San José	10,801	65	1.9	1,333,924	60	2.71	1,756,243	60	2.97	1,924,738	51	2.97	1,636,027
Santa Clara	0	65	1.9	0	60	2.71	0	60	2.28	0		2.28	
Burbank	0	65	1.9	0	60	2.71	0	60	0	0		0	
CSD 2-3	0	65	1.9	0	60	2.71	0	60	2.73	0		0	
CuSD	0	65	1.9	0	60	2.71	0	60	0	0		0	
West Valley	483	65	2.41	75,662	60	2.71	78,536	60	1.78	51,584	65	1.78	55,883
MH Subtotal				1,479,980			1,927,460			2,052,931			1,772,349
RESIDENTIAL TOTAL				79,572,440			76,163,969			78,537,156			77,046,763